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CLEAN AIR SOLUTIONS

10 WAYS

TO KEEP YOUR DUST COLLECTOR OPERATING SAFELY

Dust collectors

are necessary safety systems in many manufacturing and processing plants. But if they are not designed, installed and maintained properly, these systems themselves can cause serious problems.

Here are 10 ways

to make sure your dust collection system is up to the tasks of keeping workers safe, maximising production uptime and meeting regulatory compliance.

DEFLAGRATION PROTECTION

If your dust collector handles combustible dust, the ATEX-directives require you to equip it with deflagration protection. Venting is a common, cost-effective protection method to help keep your facility and workers safe from a potential explosion. When explosions occur, pressure inside the collector quickly builds. The explosion vent automatically opens when pressure reaches a predetermined level, allowing the flame front to exit to a safe area. This minimizes damage to the collector, the facility, and personnel.

Another option is to install flameless vents over standard explosion vents to extinguish flame fronts as they exit vented areas. Flameless vents enable conventional venting to be installed indoors where it could otherwise endanger personnel or ignite secondary explosions. If you cannot vent the pressure wave and fireball to a safe area, discuss another protection method with your dust collection professional.

Proper Vent Design

It is important to understand the pressure capabilities of your collector in order to specify the correct vent sizing. The venting vessel must be strong enough to handle the vent's deflagration and burst pressure.

Combustible dust properties are described by the values Kst (normalized rate of pressure rise, measured as bar meters/second) and Pmax (maximum pressure for an unvented dust explosion, measured as bar).

Burst pressure of the event is designed to be lower than enclosure strength. This relieves the pressure of the deflagration before it can build to levels that would destroy the collector enclosure.

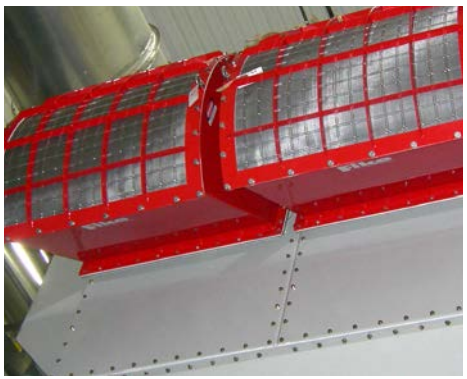
Explosion vs. Deflagration

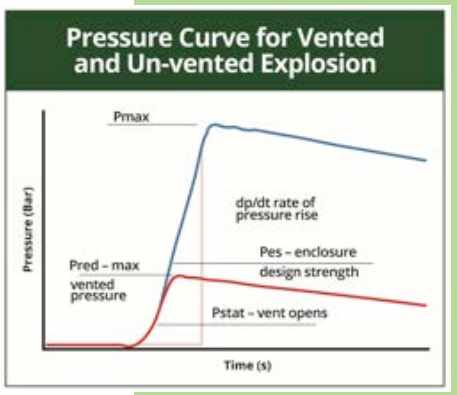
An explosion is a rapid, extreme increase in volume and release of energy. It is usually accompanied by high temperatures and the release of gases.

Deflagration is a subsonic explosion (slower than the speed of sound) that's created through a slower burning process.

Combustible Dust Properties

- **Kst** – Deflagration index (bar m/s)
- **Pred** – Reduced pressure after venting (bar)
- **Pstat** – Vent static burst pressure (psi)
- **Pmax** – Max pressure for an unvented dust explosion (bar)
- **(dp/dt)** Rate of pressure rise (bar/s or psi/s)
- **Pes** – Enclosure strength = 2/3 of yield strength of weakest part or 2/3 of ultimate strength if deformation is allowed





DUCTWORK

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Selecting dust collectors with rugged construction and properly sized deflagration vents is the most important way to safely mitigate combustible dust incidents. However, the ATEX directives also require facilities to protect the ductwork and safety processes upstream of the dust collectors. That means equipping the ducting with dampers and isolation valves designed to minimize the risk of deflagration within these components.

A flow-activated passive inlet isolation valve protects upstream work areas and processes when deflagration occurs in a dust collector. During deflagration in a dust collector, the pressure wave will close the valve preventing the passage of flame and smoke to areas upstream from the valve. The valve latches shut and must be manually opened.

If activated, components of the valve may be damaged. A thorough inspection is required prior to returning the valve back into service. The ductwork between the dust collector and isolation valve must be three times the reduced pressure after venting (Pred).

HOPPERS

The hopper is intended to funnel dust to a storage bin. Never store dust in the collector's hopper! Dust that has accumulated in a hopper creates a potential fire or deflagration risk and may also diminish the collector's performance by clogging the system and preventing the pulse cleaning from doing its job.

Some hoppers are self-dumping and provide easy dust disposal while protecting against unwanted dust leakage between the collector and hopper. A slide gate and flexible quick-disconnect hose connect the two components together, and the hopper lid is fastened with rubber clamps that create a gasketed seal to prevent dust from escaping.

When the hopper is full, simply detach it from the bottom of the collector, lift the hopper onto a forktruck, and pull a lever to swing the lid open and dump the contents into a larger disposal container. Self-dumping hoppers are used for a range of dry dusts, including those that must be reclaimed or recycled after the collection process.

Self-dumping hopper

PULSE CLEANING CONTROLS

The dust collector's cleaning system design works in conjunction with filter design. Selective cleaning controls provide an easy, maintenance-friendly way to keep filters clean using pulses of compressed air. Operators can select from continuous cleaning, on-demand cleaning and downtime cleaning.

Continuous Cleaning

Works best for:

- Porous dusts such as silica and other minerals
- High dust loading applications like thermal spray or plasma cutting
- Lightweight dust such as fumed silica and paper fines

On-demand Cleaning

Recommended for most dust types. This setting monitors the differential pressure across the clean-air section and the dirty-air filter section of the collector. With on-demand cleaning you can set a very narrow range of differential pressures to activate and stop the cartridge cleaning. This setting uses the least amount of compressed air and provides optimum filter cleaning efficiency and filter life. Keep in mind that the on-demand settings will need to be adjusted to compensate for the slow but continual rise in filter pressure drop over the life of the filter set.

Downtime Cleaning

Allows for time-based pulsing at the end of a plant shift, after completing a batch process or after an upset condition that may affect the filter's performance. Downtime cleaning allows operators to shut off the fan and clean the filters during a set duration of time. After the cleaning period is finished, the unit will shut off completely. This is an important feature because over-cleaning the cartridges during operation causes higher emissions, shorter cartridge life and higher energy costs due to overuse of compressed air.

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Pulse Cleaning Control Options

Continuous cleaning | On-demand cleaning | Downtime cleaning

EMISSIONS COMPLIANCE

The filter inside a dust collector is the most critical component to ensure that your extraction system is not only effective but also performs in an efficient manner in relation to capturing and containing the dust & fume.

If you are exhausting the air outdoors you will need to consider local environmental regulations for emission limits which are sometimes related to the process, application and type of contaminant. If your location is near to potentially sensitive areas like schools or residential areas, you might need to carry out regular emissions monitoring. Some systems have continuous emission monitoring equipment installed from the outset.

Consider that your filter selection inside your dust collector has a major impact upon the filtration efficiency and can be fundamental part of maintaining compliance. Ensure that the filter inside meets with European standard for dust filters EN60335-2-60 to Dust Class “M”. In some cases depending upon dust type you will need to consider using a secondary HEPA filter stage.

Dust Class	Intended use	Degree of penetration [D]
L	Filtering out dust with AGW values >1 mg/m³	< 1,0 %
M	Filtering out dust with AGW values ≥ 0.1 mg/m³	< 0,10 %
H	Filtering out dust with AGW values, dust of carcinogenic hazardous aerosols ((§3 (2) GefStoffV) and dust containing pathogens	< 0,005 % [1)]

1) The filter elements for Dust Class H must be leak-free. “GefStoffV” = Gefahrstoffverordnung [= Hazardous Substances Decree]

FILTER
CHANGE-OUT

Ideally, your workers never have to enter the dust collector to change the filters. Dust collectors that require entry during service put workers at risk and require companies to file confined space entry permits and monitor for gas. For that reason, many cartridge-style dust collectors offer ease of filter change-out.

For optimal safety,

filters should be positioned for ease of access. They should also easily slide in and out of the housing. Simple, quick-open heavy gauge doors can provide safe change-out. Look for doors that are fully reversible for access from either side and have a lock-out feature for worker safety.

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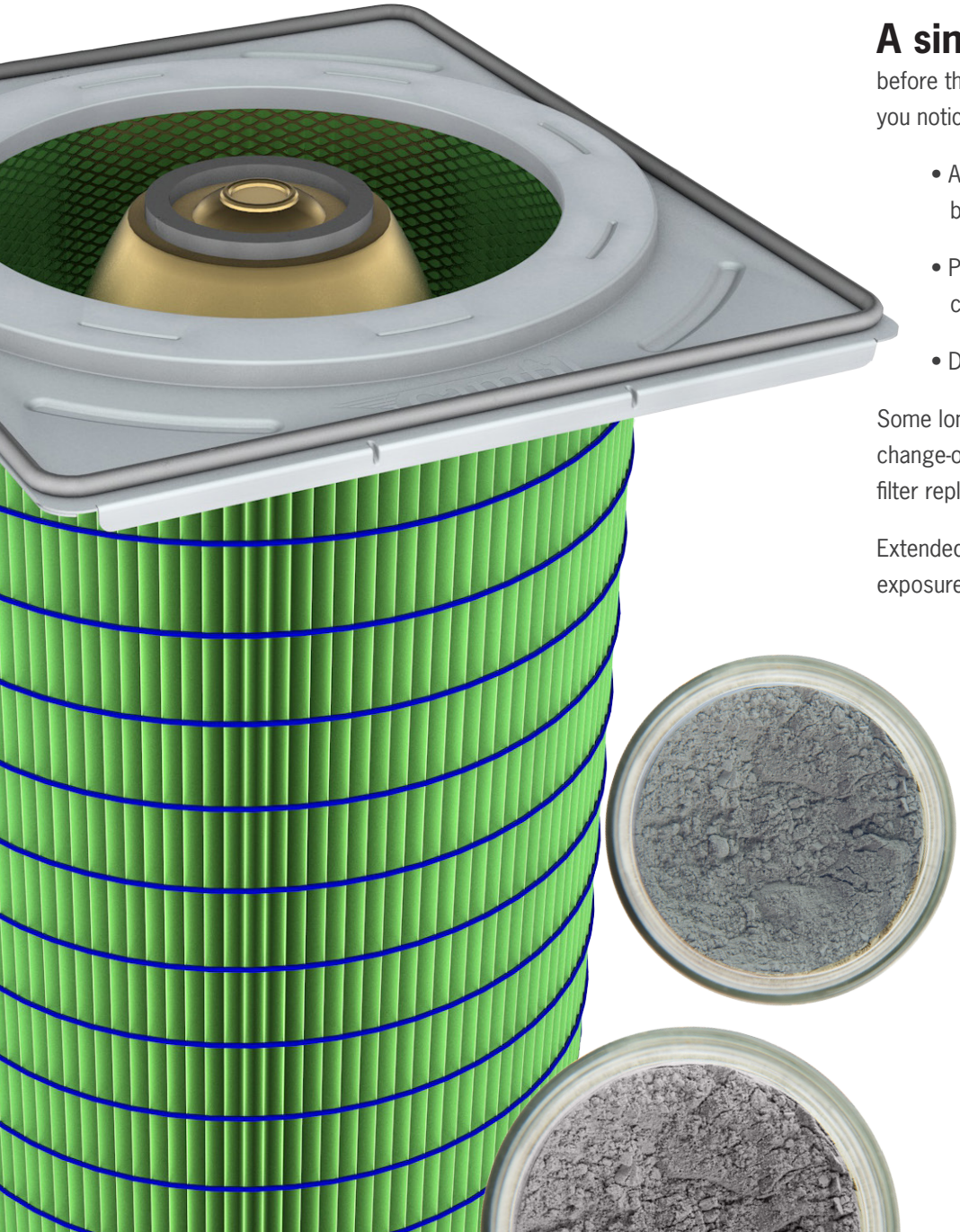
LONG-LIFE FILTERS



A simple but important safety rule is to change out filters before they become laden with dust. This minimises worker exposure. Replace the filter if you notice:

- Airflow through the system has reached the differential pressure limit prescribed by the manufacturer
- Pressure drop across the collector is negatively affecting the ability of the dust collection system to capture dust
- Dust escapes the filter into the facility

Some long-life cartridge filters can operate for two years or longer between change-outs. However, heavy dust-loading applications generally require more frequent filter replacements.

Extended-life cartridge filters also can reduce filter change-outs and minimize worker exposure. This also saves on maintenance and disposal costs and reduces landfill impact.

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FIRE
PREVENTION

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For spark-generating applications, a range of features and technologies are available including:

- Flame retardant filter media
- Drop-out boxes
- Perforated screens or cyclone devices installed at collector inlets
- Fire sprinkler systems
- Vertically-mounted filter cartridges

Dust collectors that use vertically-mounted cartridges have a reduced fire and deflagration risk. With horizontally-mounted systems on heavy dust loading applications, dust becomes trapped at the top of the filters, and there is no pre-separation of heavy or abrasive particles from the air stream. This situation can shorten filter life and provide a dusty surface for sparks to ignite. Vertical mounting reduces heavy loading dust on the filters and helps eliminate these problems.

SAFETY
ACCESSORIES

You can further enhance your dust collector's safety performance by using additional safety accessories. For example, railed safety platforms and caged ladders which are compliant with local health and safety regulations and prevent slips and falls when operators access the collector for service. Lock-out/tag-out doors prevent injury caused by the inadvertent opening of doors during a pulsing cycle and/or exposure to hazardous dust. Where highly toxic dust is being handled, a Bag-In/Bag-Out (BIBO) containment system may be required to isolate workers from used filters during change-out.

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Safety Accessories

- Railed safety platforms
- Caged ladders
- Lock-out doors
- Bag-In/Bag-Out filter containment

SAFETY
MONITORING FILTERS

Safety monitoring filters

are a secondary bank of high-efficiency air filters. They prevent collected dust from re-entering the workspace if there's a leak in the dust collector's primary filtering system.

These filters are a required component in dust collection systems that recycle air downstream of the collector. By recirculating heated or cooled air back through the plant, you eliminate the cost to replace that conditioned air. Recirculating systems also reduce regulatory paperwork. By containing the air indoors, you can avoid the time-consuming permitting involved when contaminated air is exhausted outside.

PUTTING IT ALL TOGETHER

By addressing these 10 areas of attention, you can significantly enhance the safety of your dust collection system.

Camfil APC experts can help assess your system, applications and physical space for the best solutions to help keep your workers safe and your operation in compliance.

To learn more about how Camfil APC can help keep your dust collectors operating safely, contact your local sales office or visit **camfil.com.**

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