

Dust Collection Tips to Keep “Free-From” Foods Safe from Cross-Contamination

Cross-contamination is a serious concern in the food processing industry, especially for manufacturers that process foods “free-from” gluten or allergens. Facilities that produce both non-allergy-friendly or gluten-containing foods and “free-from” foods face even more challenges. The best way to prevent food particles from settling on surfaces and equipment where they can cross-contaminate is to collect them at the source. This white paper explains how high-efficiency industrial dust collectors are used as a proven engineering control to filter dust-borne allergens and significantly reduce the risk of cross-contamination.



By David Steil, Chris Fluharty and Kevin Tucker

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by David Steil, Chris Fluharty and Kevin Tucker, market managers for Camfil APC

If you manufacture allergen-free or gluten-free foods, it is absolutely essential to keep any trace of these contaminants out of your products. There’s so much at stake...your responsibility to your customers, your reputation and your business success. According to Food Allergy Research & Education (FARE), up to 15 million Americans have food allergies, and each year 200,000 Americans require emergency medical care for potentially life-threatening allergic reactions to food.

Another major driver of the “free-from” food trend is the growth of the gluten-free market. More and more consumers are turning away from products that contain gluten for medical reasons, health reasons or simply preference. And even besides gluten, today’s consumers want to know what’s in their food, where it came from and how it was produced.

The danger is cross-contamination – when a “free-from” food or food product is exposed to an ingredient or food containing a contaminant or non-free-from material. Avoiding cross-contamination of your “free-from” products can be a challenge if you make those products in a facility where non-allergy-friendly or gluten-containing foods are also made. Your food can’t be “free-from” unless your facility and your processing equipment are as well. That includes the air quality in your facility, which can contain dust from airborne food particles.

In fact, the FDA’s Food Safety Modernization Act requires food processing facilities to implement allergen controls. These are written procedures the facility must have and implement to control allergen cross-contact and ensure allergens are appropriately listed on the labels of packaged food products.

Food processors must also include and document actions to:

- Identify and correct a problem implementing a preventive control
- Reduce the likelihood the problem will recur
- Evaluate affected foods for safety
- Prevent those food products from entering commerce if they cannot ensure that the affected food is not adulterated.



Wheat grain processing

FDA Food Safety Modernization Act

Preventive measures required to ensure that hazards will be minimized or prevented include:

- Process controls
- Food allergen controls
- Sanitation controls
- Supply-chain controls
- Recall plan



Ground peanuts for peanut butter processing



Gold Series® high-efficiency industrial dust collector

Dust collector systems for food processing facilities

The best way to prevent food particles from settling on surfaces and equipment where they can cross-contaminate is to collect them at the source while they are being processed and still airborne. Common food dust collection challenges include cereal ingredients, spices, raw grains, egg shell dust, flours, corn starches, sugars and other sticky materials. If your facility produces both “free-from” foods and standard food products for a more general consumer audience, industrial dust collection is your first line of defense in controlling cross-contamination.

Without a dust collection system, food particles will soon settle on floors, equipment and other surfaces where they are difficult to remove. Traditional cleaning products like mops, brooms, compressed air and standard vacuum cleaners can’t effectively collect all of the contaminant-containing dust from the processing area. Even worse, they tend to kick the dust up into the air, redistributing it to other parts of your plant and contaminating your “free-from” food products.

A highly engineered industrial dust collector is designed to meet the multiple and specific challenges that food processing facilities face. They capture airborne food particles where they are generated and never allow them to settle. These dust collectors are a proven engineering control to filter dust-borne allergens and significantly reduce risk of cross-contamination.

There are many factors that go into a successful design and operation of this equipment. Filter cartridges that are vertically mounted, pleats that are wide and uniformly open and secondary HEPA filtration are a great starting place.

Filter Features that Control Contamination:

- Vertical filter orientation
- Wide-pleat filters
- Secondary HEPA filters
- High-efficiency filters

Placement of the dust collector

A typical layout would be a single dust collector placed in a room collecting ambient airborne ingredients in the work area. Unfortunately, with this design much of the dust settles in the work area before reaching the collector, due to poor design and application, followed by short filter life and a decrease in ventilation. That means cross-contamination from allergens and glutes with your “free-from” products is inevitable.

A better system for high volume dust collection is one that captures food dust at the source using stainless steel pickup hoods at each production station. Whether you are hooking directly to batch mixers or high velocity slot hoods behind weigh stations, these collectors pull airborne particulates into ducting and then into the dust collectors. It is ideal to place dust collectors in a location where dust can be effectively and safely discarded. Several other design features come into play to control cross-contamination from food dust including filter orientation, filter media and filter design.

Vertical and horizontal filter cartridges

Filter orientation is very important. Dust collectors with horizontally-mounted filter cartridges have been used in the food processing industry for years. The problem with horizontal mounting in high dust loading applications is that the dust does not get cleaned off the top of the filter. This causes the dust to blind at least one third of the filter.

Also, because the incoming dust is dumped on top of the filters, there is no pre-separation of heavy or abrasive particles from the air stream. This situation can shorten filter life or, in spark generating applications, pose a fire hazard because any spark entering the collector will come into direct contact with filter cartridges. Rotating the horizontal filters periodically helps dislodge dust, but also increases the chance of contaminants escaping into the air.

Vertically mounted filter cartridges incorporate a high, side entry inlet with a series of staggered channel baffles that distribute the air and separates out larger particles, dropping them straight into the collection hopper. This reduces the load on the filters in heavy loading applications.

Vertical mounting also allows dust to release uniformly from the filter pleats, since it doesn't have to fight gravity. This helps extend filter life and reduces release into the air, since the filter compartment only needs to be opened when it is time to replace the filters. Bag-in/bag-out options are also available to further reduce exposure during filter replacements and the potential for cross-contamination.

A vertical filter design combined with a crossflow inlet delivers unparalleled performance in maintaining low pressure drop, which means consistent design air flows, which captures more allergens and other contaminants. Pulsed air is disbursed more evenly throughout the length of the filter cartridge for more effective use of the pulse energy. And, because the direction of the pulse is straight down into the hopper away from the filters, it forces light dust particles into the hopper and out of the air stream.



HemiPleat® Gold Cone™ cartridge filter

Why a wide-pleat filter?

Installing a high-efficiency dust collector with durable wide-pleat filters is the best solution for food processing environments, especially in critical applications where even the smallest amount of contamination is too much. Most dust collection



Wide-pleat style cartridge filter media

cartridges use tightly packed media configurations. This means much of the media surface area is unavailable for filtering, allowing dust to remain trapped within the filter – even after pulse cleaning.

Instead, look for wide-pleat filters that use synthetic bead pleat separators to keep the pleats wide and open. These separators prevent the media from folding over on itself, which causes the filter to plug. This design also allows use of the entire filter media, because virtually all the media surface is exposed to the airstream. The filter operates at lower differential pressures, experiences better dust release during pulsing, and extended filter life.

Secondary HEPA/iSMF filters

HEPA-grade integrated secondary monitoring filters (iSMF) are typically recommended to provide backup protection for the dust collector and to allow release of the filtered air directly back to the work space. When recirculating air downstream of the collector, the addition of a secondary HEPA filter system is recommended for multi-product manufacturing facilities where cross-contamination is a concern. The HEPA filters provide backup protection as well as a final cleaning of the air before

it goes back through the facility. In addition, iSMF systems have been tested as an outlet isolation device/flame front barrier in accordance with National Fire Protection Association (NFPA) standards.

Measuring filter efficiency

The efficiency of primary cartridge filters may be expressed as a Minimum Efficiency Reporting Value, or MERV, based on a scale from 1 to 16, with MERV 16 being the highest efficiency. Food dust particles are often very small and difficult to capture and retain. Grain dusts can be as small as 5 microns, starches as small as 3 microns, and milled flour down to 1 micron. It is important to verify that you are using filters with the correct efficiency for your specific dust. For dust that is less than 3 microns in size, it is recommended to use filters that are MERV 15 or above.



HEPA-grade integrated secondary monitoring filter (iSMF)

Importance of testing your dust

Selecting the right filters for your food processing applications is vital to the efficiency of your dust collection system. Filter media is determined by the characteristics of the dust, so it is important to have samples of dust from your application and facility tested by a reputable dust lab. Dust test results help you make an informed decision on the right air-to-media ratio as well as the correct cartridge media for your application. This is a very important step to help mitigate cross-contamination of your “free-from” products from other food particles.

To select the right filters and system components, test your dust for:

- Particle size and shape
- Gravity
- Moisture absorbency
- Abrasiveness
- Explosibility

Dust testing should include analysis of the particle size, shape and characteristics of the dust at your food processing facility. Tests can also examine the dust’s true specific gravity and identify if your dust is hygroscopic, or moisture-absorbent. Abrasion testing helps to determine potential wear of the filters, as well as the optimal design of dust-handling components like valves, inlets and ductwork. Explosibility testing that determines whether a dust is combustible helps to determine if additional design requirements may be needed.

Combustible dust

Combustible dust explosions are a risk in many areas of a food manufacturing plant, including the dust collection system if it is not properly configured and maintained. Having a dust collector reduces the chance of incidences in the facility from dust build-up on floors and other surfaces. But dust collectors must be equipped with deflagration protection to mitigate combustible dust incidents and comply with NFPA requirements.



Flameless explosion vents

“Dust collectors must comply with NFPA requirements for mitigating combustible dust.”

Although there are many forms of explosion protection, one example of a passive method is venting. An explosion vent opens when predetermined pressures are reached inside the collector, allowing the excess pressure and flame front from the deflagration to exit to a safe area. It is designed to prevent loss of life and minimize damage to the collector and the facility. Preventing the dust collector from blowing up in the event of a deflagration, thereby reduces the hazard.

A flameless vent is designed to install over a standard explosion vent and extinguish the flame front exiting the vented area, not allowing it to exit the device. This allows conventional venting to be accomplished indoors where it could otherwise endanger personnel or ignite secondary explosions.

The NFPA requires protection for the ductwork and safety processes upstream of the dust collector. Ducting should be equipped with dampers and isolation valves designed to minimize the risk of deflagration within these components. A flow-activated passive inlet isolation valve protects downstream work areas and processes from the propagation of flame and pressure through the inlet duct when deflagration occurs in a dust collector.

If deflagration does occur 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 and a thorough inspection is required prior to returning the valve back into service. Make sure that your isolation device meets the latest NFPA standards.

Final Thoughts

Producing “free-from” food products requires special handling during every step of the process. Extra care is needed in facilities that also process food for general consumption. It is critical to design the right system and select the best equipment for your specific application and food dust characteristics. A high-efficiency dust collector with vertically mounted wide-pleat filter cartridges can significantly control airborne dust and help prevent cross-contamination issues in your factory. This important safety measure is vital to the quality of your food products, the well-being of your customers and your brand’s reputation.

Dust Collector Explosion Prevention:

- Flameless vents
- Dampers
- Isolation valves

REFERENCES

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