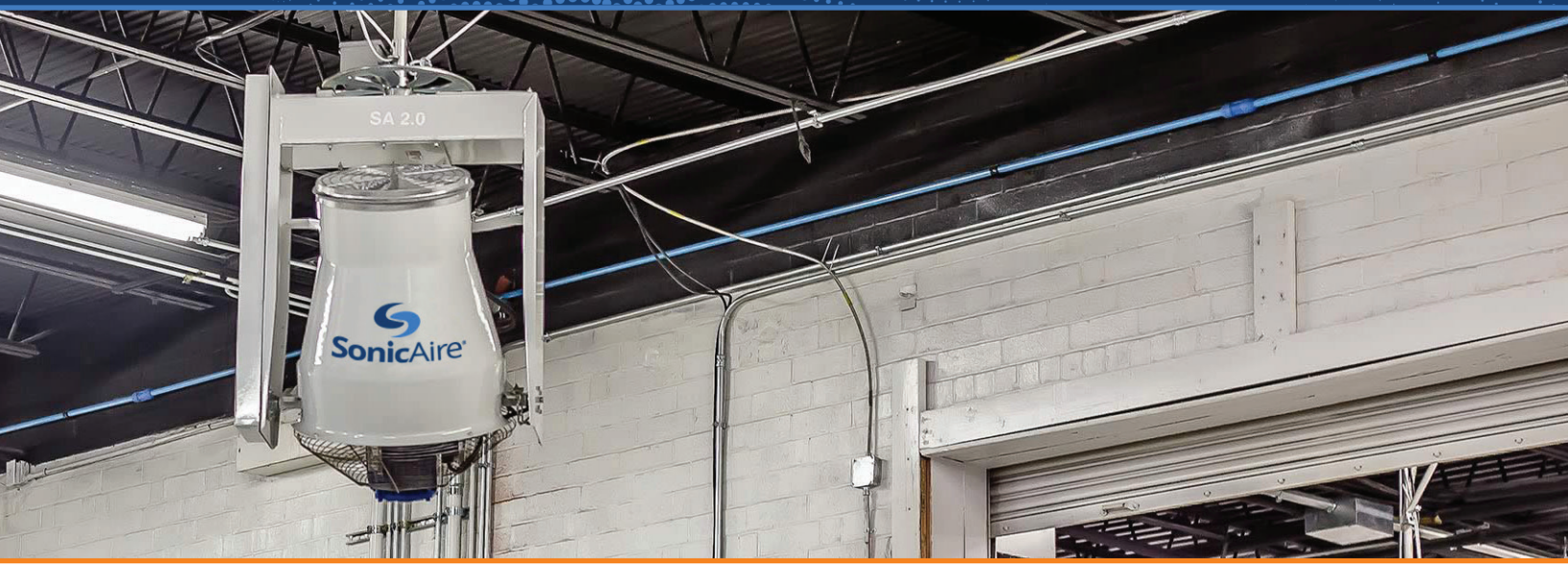
How to Eliminate Combustible Dust in Your Facility



5 Factors to Consider in Developing a Dust Control Plan

SonicAire®

Contents

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Chapter 1

Reducing Combustible Dust to Improve Safety

119. That's the number of workers killed by combustible dust incidents between 1980 and 2005. Another 718 were injured.

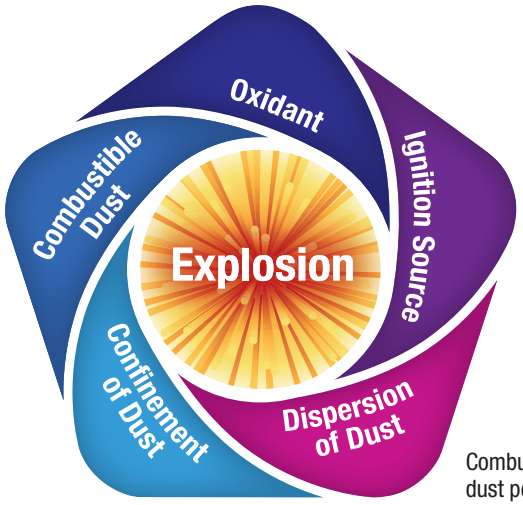
These alarming stats were revealed by an extensive study conducted by the U.S. Chemical Safety Board (CSB) in 2006.

By 2017, another 111 combustible dust incidents had occurred which resulted in an additional **66 fatalities and 337 injuries.**

In order to understand how to prevent these tragedies, one must understand what causes a combustible dust incident. When certain elements and conditions exist simultaneously, the result can be a fatal. The scenario leading to a dust explosion can be complex, but prevention is simple. Elimination of just one of the five elements in the Combustible Dust Pentagon makes a dust explosion impossible.

The Five Elements for Combustible Dust Events

1. An application that generates organic dust (i.e., wood and paper product processing, textile processing, chemical processing). In certain conditions, metals can also generate combustible dust. Over half of the incidents reported in the 2006 CSB study occurred in the food, lumber/wood products and chemical manufacturing industries.
2. A suspended cloud of dust (dispersion)
3. Confined conditions to trap the dust cloud (a building)
4. Oxygen (air)
5. An ignition source – This can be a variety of heat sources, including any operation that produces open flames, heat or sparks (cutting, grinding, steaming, welding, soldering, etc.) Even the machinery itself, such as bearing failure, or a conveyor belt, can produce a spark that can ignite a combustible dust fire.



Combustible dust pentagon

Risk Reduction Is Critical to Enhancing Safety Performance

Aware of this danger, facility operators are looking for solutions to reduce their risk. Industrial dust fans have proven to be a proactive solution that effectively prevents buildup which could cause dust explosions and creates a safer, healthier and more efficient work environment.

The effectiveness of these dust fans is based simply on their ability to prevent overhead dust accumulation. By keeping dust from building up on overhead surfaces, the need for high-level housekeeping is virtually eliminated, and the risk of dust dispersion due to dust falling from overhead, which could lead to an explosion, is mitigated.

Additional Benefits

As dust control fans reduce the risk of combustible dust events, they provide several additional health and safety benefits to facility owners and their employees:

Regulatory compliance: Due to the threat posed by combustible dust, it is of significant concern for OSHA and NFPA. Companies that do not meet standards set by these organizations face severe penalties. Just last year, a metal tank manufacturer was fined $101,800 for dust accumulation related issues. Industrial dust fans are designed to prevent this accumulation and allow facility operators to comply with government regulations.

Safe housekeeping: Without industrial dust control fans in place, workers must find another way to keep the facility clean. This usually involves accessing hard-to-reach areas, which can be a dangerous task. It may also require operational shut-down while cleaning is completed. Dust control fans accomplish these overhead cleaning chores, so workers do not have to be put at risk. This also results in cost reductions, as workforce resources do not have to be diverted to time-consuming cleaning tasks, and employees can remain productive in other areas.

Improved morale: When employees are surrounded by a clean, safe environment, morale is higher. Staff enjoy a better frame of mind, knowing they are working in a clean facility where health risks are low and safety levels are high. This, in turn, can lead to increased production and a healthier bottom line.

A metal tank manufacturer was fined **$101,800** for dust accumulation related issues.

Manual housekeeping can be dangerous, costly and interrupt production.

Chapter 2

NFPA 652 Dust Hazard Analysis: Is Your Company Compliant?

Is your business compliant with the requirements of NFPA 652? SonicAire can help. Here's an overview of the updated standard and steps you can take to ensure your operations will be in compliance with the regulations*.

What is NFPA 652?

This National Fire Protection Association standard outlines the requirements for the management of fire and explosion hazards related to combustible dusts. Updated from its previous version, the 2019 NFPA 652 included several changes. One addition for 2019 found in Chapter 7 of NFPA 652 requires facilities to complete a dust hazard analysis (DHA), demonstrate progress in completing a DHA in years leading up to the deadline, and review and update the DHA every five years.

This standard is the go-to source for facility managers, inspectors, safety personnel, contractors and engineers for handling combustible dust safety in any industry.

What is combustible dust?

NFPA 652 defines combustible dust as "a finely divided combustible particulate solid that presents a flash fire hazard or explosion hazard when suspended in air or the process-specific oxidizing medium over a range of concentrations."

What is a DHA?

A Dust Hazard Analysis is a facility review that examines all areas where combustible dust is present. This analysis identifies hazards related to explosions and fires. A DHA categorizes each area of the facility as Not a Hazard, Might Be a Hazard, or Deflagration Hazard. If any hazard areas are identified, the facility must define safe operating ranges, list any existing hazard management methods, and identify additional options to consider for future hazard management.

Are you compliant?

SonicAire can partner with you to prepare the overhead and hard to reach areas of your facility for NFPA compliance. Our innovative engineering designs help prevent hazardous conditions and create a cleaner, healthier and more efficient work environment for your operations. Our dedicated team can recommend the ideal dust control system for your operations, creating a customized solution to meet the NFPA standard and help you prevent dangerous dust explosions at your site.

** September 7, 2020 is the deadline for businesses to comply with the requirements of NFPA 652.*

Who must meet this standard?

NFPA 652 pertains to all industries that include processes that can generate combustible dust, although it specifically addresses the metal, agricultural, chemical and wood processing industries. According to OSHA, the risk of combustible dust explosions is present in a wide range of industries, including those that process food, grain, tobacco, paper, rubber, dyes, plastics, pesticides, metals, pharmaceuticals and pulp.

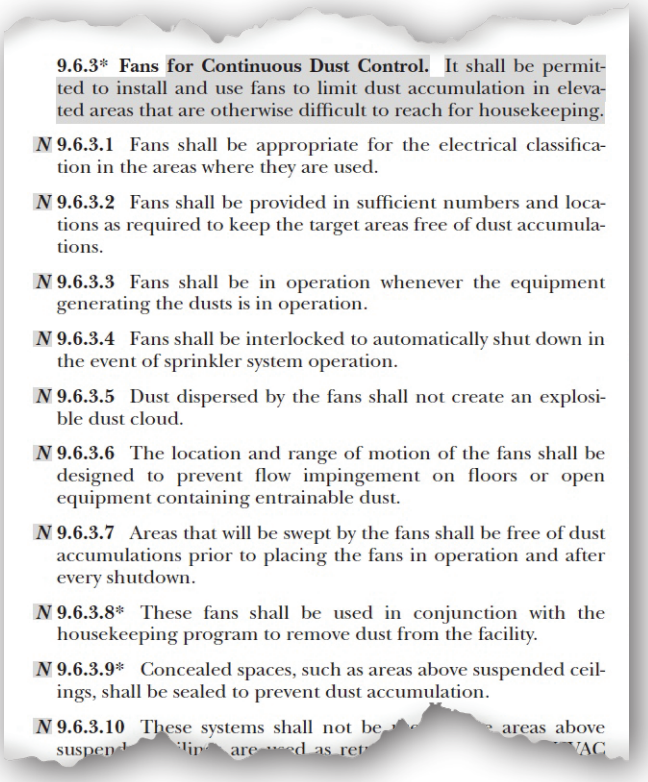
Why is this standard necessary?

Between 2008 and 2012, 50 dust-related explosion incidents occurred in the United States. In the past four decades, more than 1,000 workers have been injured and another 185 killed in combustible dust events, according to OSHA. To prevent future tragedies, the NFPA has established standards that are designed to keep facility conditions safe. By adhering to these requirements, facilities can reduce their risk of deadly dust events.

How can facilities comply with NFPA 652?

NFPA 652 includes hazard management steps for mitigation and prevention. These sections cover several topics, including guidelines for housekeeping, equipment design and continuous dust control. Included here are industrial dust control fans such as those made by SonicAire. (See NFPA 652 Chapter 9.)

This engineered solution is the ideal option for organizations seeking to improve housekeeping and align their practices with NFPA standards. By installing these dust control fans, facilities can quickly bring their high-dust areas into compliance with NFPA standards. Because these standards are used by OSHA as part of their inspection requirements, adhering to NFPA guidelines will not only increase safety, but it will also prevent steep fines which can be assessed by OSHA.



9.6.3* Fans for Continuous Dust Control. It shall be permitted to install and use fans to limit dust accumulation in elevated areas that are otherwise difficult to reach for housekeeping.

N **9.6.3.1** Fans shall be appropriate for the electrical classification in the areas where they are used.

N **9.6.3.2** Fans shall be provided in sufficient numbers and locations as required to keep the target areas free of dust accumulations.

N **9.6.3.3** Fans shall be in operation whenever the equipment generating the dusts is in operation.

N **9.6.3.4** Fans shall be interlocked to automatically shut down in the event of sprinkler system operation.

N **9.6.3.5** Dust dispersed by the fans shall not create an explosible dust cloud.

N **9.6.3.6** The location and range of motion of the fans shall be designed to prevent flow impingement on floors or open equipment containing entrainable dust.

N **9.6.3.7** Areas that will be swept by the fans shall be free of dust accumulations prior to placing the fans in operation and after every shutdown.

N **9.6.3.8*** These fans shall be used in conjunction with the housekeeping program to remove dust from the facility.

N **9.6.3.9*** Concealed spaces, such as areas above suspended ceilings, shall be sealed to prevent dust accumulation.

N **9.6.3.10** These systems shall not be [illegible] areas above [illegible]

Excerpt from NFPA 652 Chapter 9.

Chapter 3

What Is the True Cost of Combustible Dust?

Webster defines cost as "an amount that has to be paid or spent." This concise definition describes a simple transaction. I pay x for y. But when it comes to combustible dust, the cost isn't this straightforward. To count the true cost, we have to dig a little deeper.

Immersed in a world of business transactions, it can be easy to focus on the up-front cost of maintenance and safety measures regarding combustible dust. Facility managers consider the cost of cleaning services and maintenance equipment. The costs that are less straightforward can get lost in the dust, so to speak.

If we zoom out and take a more comprehensive look at combustible dust, we see that the true cost can be far greater than that of proactive measures to control combustible dust issues.

Monetary Cost

OSHA standards address combustible dust hazards, setting guidelines for safe work environments. Facilities must adhere to OSHA regulations to avoid hefty fines. Some of these regulations are industry specific, while others are general practices. Many states have state-wide occupational and safety programs that address these standards.

According to the Solicitor of Labor, Federal OSHA conducted 476 inspections in 2017 related to combustible dust. These inspections resulted in 319 citations.

Over the past several years, companies have discovered just how severe these citations can be. In 2014, OSHA inspected a lumber manufacturer in Georgia and discovered a build-up of combustible dust and repeat violations. The company was fined $279,400. That same year, OSHA fined a processing and packaging company $254,000 for "exposing workers to combustible dust."

Not all fines have been this high. In 2018, a metal tank manufacturer was fined "only" $101,800 for dust accumulation. Still others have been much higher. A grain processing facility in Cambria, Wisconsin, suffered a dust explosion in 2017 that resulted in $1.8 million in OSHA fines.

Production Cost = Production Lost

While costly, fines aren't always the worst consequence of combustible dust. If appropriate steps are not taken to control the dust, a facility may experience a combustible dust explosion or fire.

These events can shut down production for a few hours, a few days, or forever. With each passing minute of down-time, valuable production time is lost. Even minor incidents can cause damage that requires significant downtime for repairs.

Consider the math. If your facility makes 600 units per hour at an average selling price of $50 each, your company loses $30,000 in revenue for every hour of downtime. The greater the scale of production, the greater the loss. For example, the average automotive manufacturing plant loses more than $20K per minute of downtime.

While proactive measures to control combustible dust may require a degree of lost production up front, this cost is small compared to that of recovery from a combustible dust explosion.

Ultimate Cost

Lost production is expensive but examining this cost still doesn't cover the full impact of combustible dust. Too often, when facilities experience a combustible dust event, people are injured, and lives may be lost.

The Chemical Safety and Hazard Investigation Board (CSB) reports 66 fatalities and 337 injuries due to combustible dust incidents occurred in the U.S. between 2006 and 2017. In 2017 alone, 237 combustible dust explosions and fires around the globe injured 163 and killed 13.

While awareness of the dangers of combustible dust has grown in recent years, these incidents continue. In September of 2019, a dust explosion at a cosmetics plant in New Jersey left a worker seriously injured, another dust incident at a spice manufacturer in the Netherlands injured three, and a dust explosion at a German woodworking facility injured one employee.

Chapter 4

5 Mistakes You May Be Making with Industrial Dust Control

News coverage of combustible dust incidents and heightened standards for dust control have increased the awareness of industrial dust hazards. Yet, some common misconceptions regarding this key safety issue continue to circulate.

These misconceptions can cause facility managers to make critical mistakes with their industrial dust control procedures. Following are five of the most common.

1. Out of Sight, Out of Mind

This adage often refers to people or objects, and it can apply to industrial dust as well. If dust is located in out-of-the-way areas, the issue of combustible dust hazards can drop off your radar. And this can prove disastrous.

The mistake some facility managers make is to assume that the dust is not a problem because they can't see it. *"It's out of sight, so it doesn't affect my operations or employees."* This couldn't be further from the truth. Similar to that is the assumption, *"It can't happen here."* Lack of hazard awareness can contribute to how employees react when they observe dust.

In fact, this dust is often located in spaces that aren't readily visible. This is part of what makes it so dangerous. The industrial dust builds up without notice and becomes a potential hazard. Then, without warning, it can contribute to a combustible dust explosion or fire, which can spread to all areas of the facility.

2. Manual Methods Are Sufficient

Manual housekeeping measures may prove helpful to maintaining plant safety. Typically, however, they are not enough to properly maintain a safe environment. They also involve risks that can be dramatically underestimated when facility owners calculate the cost of cleaning efforts.

First, manual methods can put workers at risk. Accessing hard-to-reach areas may require climbing to dangerous heights and using complex harnesses or unfamiliar machinery. If injuries occur during manual cleaning, the company could face litigation. Lawsuits are also possible if the manual methods are ineffective and an explosion causes injuries or deaths.

Second, manual housekeeping methods require significant investment of resources. Not only do facility owners have to allocate budget to cleaning supplies, equipment and personnel, but they may also suffer from lost production if downtime for cleaning is required beyond normal shutdowns. All of this adds up to significantly more cost and risk than many business owners realize.

Finally, some manual cleaning methods may actually worsen the dust issue rather than improve it. For example, using compressed air or steam to clean surfaces can risk shifting dust to other areas of the facility. According to OSHA, *"if compressed air or steam must be used, it is vital to first ensure that potential ignition sources in the vicinity are eliminated and apply the air or steam only under low pressure to avoid disbursing clouds of dust to other areas."*

3. We Don't Make Very Much Dust

"I'm not making that much dust. I'm sure we could pass any inspection." Making this assumption is a mistake—and it can be a costly one. You might be surprised how little dust can warrant OSHA action. This agency adheres to standards set by the National Fire Protection Agency (NFPA). According to the NFPA, an accumulation of as little as 1/32" of dust can be hazardous. That's the thickness of a single paper clip.

It's also important to consider the variability of industrial dust. OSHA reports that two dusts made of the same material can pose different risks for ignition and explosion based on their shape, size and moisture content. Additionally, these dust traits can shift during processing and manufacturing. The result: dust that you thought was minimal or benign could be dangerous after all.

If OSHA determines you are in violation, you could pay a hefty price. OSHA penalties range from $5,000 to $70,000 per violation. Case in point: In August 2019, OSHA listed combustible dust among the safety and health hazards present at a manufacturer of electronic enclosures. The company now faces $161,020 in penalties.

4. OSHA Won't Notice

A second OSHA-related mistake is to assume this agency will not inspect your facility. While some locations may be more likely than others to undergo inspection, it is not wise to assume an agent will never arrive on your doorstep. In 2017, OSHA conducted 476 inspections related to combustible dust. These resulted in 319 citations.

How likely are you to be among these numbers in the future? OSHA prioritizes by hazard level. Imminent danger situations top the list, followed by reported injuries and illnesses, worker complaints, referrals from other agencies, and, lastly, specific high-hazard industries.

Your facility might not fit the bill for imminent danger, but if OSHA receives any complaint or notice about the condition of your facility, an inspection could be imminent. And even if combustible dust issues don't instigate the inspection, if they are discovered during the process, you could face penalties.

5. Dust Collectors Will Do the Trick

As with manual housekeeping measures, dust collectors play an important role in industrial dust control, but they are not 100% effective. These devices can miss some of machine- and floor-level dust as well as airborne dust that then settles and accumulates in overhead areas.

One Pennsylvania-based wood pellet manufacturer's findings demonstrate the significance of this less-than-perfect system. The operations manager reports, *"Even if we contained 99.99% of the dry dust going into the pellet mill, that would still lead to over 130 pounds of dry dust becoming airborne per week from each pellet mill."*

With this much dust accumulation possible, additional methods are necessary to reduce the risk of combustible dust events.

Chapter 5

How Do Industrial Dust Control Fan Systems Work?

For industrial plants, one by-product of operations is inevitable: dust. In many settings, this otherwise harmless debris can pose serious threats to the safety of the facility. Industrial dust control fans are designed to eliminate this danger in overhead and hard to reach areas of the facility.

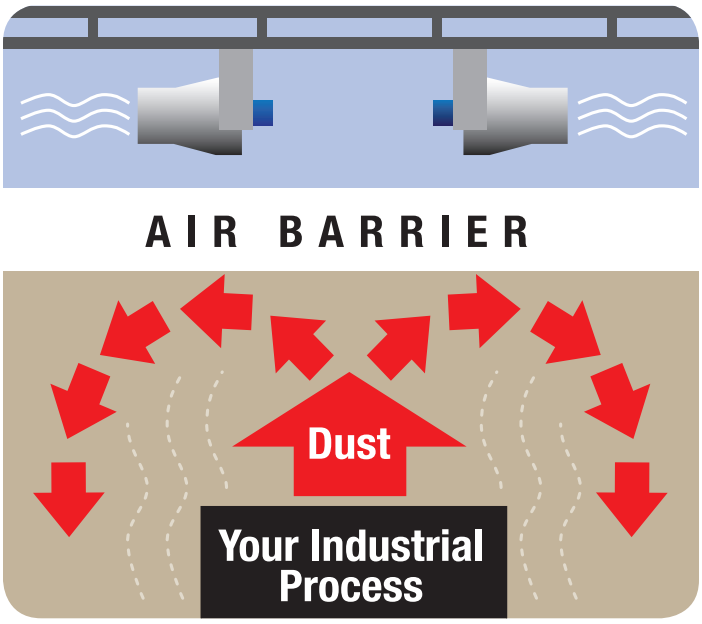
How? Industrial dust control fan systems provide a proactive solution that prevents dust from accumulating in the first place. They are designed and arranged to provide maximum cleaning power that keeps plants clean and safe.

This design involves three key components.

1. Proprietary Technology

SonicAire industrial dust control fans use BarrierAire™ technology. The fans' operation forms an air barrier that keeps dust, lint and fibers at the floor level of a facility. This technology uses two methods to control dust flow:

- **Thermal-current control:** Typical airflow includes the movement of thermal currents which naturally bring dust into the air. Upward currents carry particles to overhead areas of facilities, where dust quickly accumulates and can become a fire hazard. Industrial dust control fans prevent these upward thermal currents from holding dust in the air.
- **High-velocity airflow:** The fans use high-velocity airflow to keep overhead areas clean. The strength of this airflow effectively prevents the accumulation of combustible dust particles on overhead structures in the plant. Areas that used to be covered in cobwebs and dust blankets are kept clean by the fans' effective operation.



How industrial dust control fans work: Strategic fan placement creates an air barrier that keeps dust, lint and fibers at floor levels of a facility. Using thermal current control and high-velocity airflow, the fans keep overhead areas clear of dust and prevent upward thermal currents from holding dust in the air.

Before installation of a SonicAire dust control fan system.

After installation and use of a SonicAire dust control system to clear away combustible dust.

2. Strategic Installation

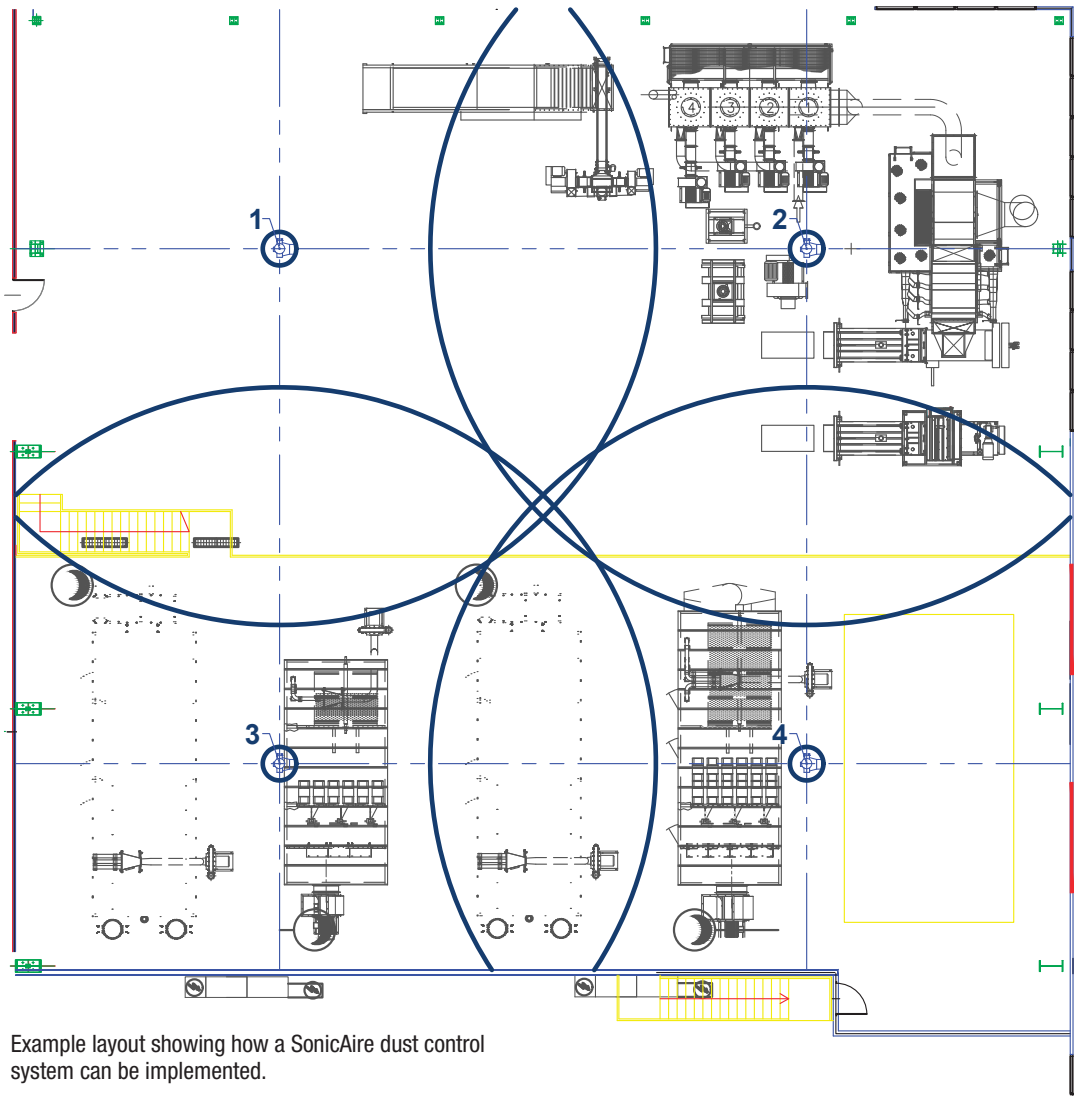
Industrial dust control fans are arranged to maximize cleaning and minimize the number of fans required for the plant. This strategic installation involves three elements:

- **Engineered application:** Industrial dust control is based on the size and shape of the plant, its processes and any other variables that can affect the accumulation of combustible dust. To achieve maximum results, a knowledgeable system engineer, familiar with the dynamics of plant airflow, the nature and type of dust, dust accumulation, potential hazards and employee safety considerations, will design a system to meet the specific requirements of the plant. The design will include the recommended fan equipment, placement and accessories for optimal performance.
- **Expert set-up:** Once the system is designed for effective results, it is installed by a contractor or by plant operations.
- **Fan controls:** SonicAire offers a variety of control features to automate fan operation, integrate with fire alarm systems, coordinate with plant processes and strategically modify the speed and performance of the fans for maximum efficiency.

3. Impressive Results

Industrial dust control fans effectively direct dust downward where it can be cleaned using regular low-level housekeeping methods. As a result, facilities can:

- **Adhere to government regulations.** Industrial dust control fans allow plant operators to clean structural supports, pipes, ducts, process equipment and other hard-to-access areas to meet or exceed government regulations. The fans help keep plants in compliance with relevant OSHA and NFPA regulations concerning combustible dust.
- **Provide a safer employee environment.** Industrial dust control fans are designed to prevent combustible dust accumulation. This reduces the risk of fires and explosions and creates cleaner air, effectively improving the health and safety of the work environment. Employee safety and morale is further enhanced by eliminating the need for workers to clean areas that can be dangerous to access.
- **Reduce labor costs.** Manually cleaning hard-to-access areas is a time-consuming task. It also takes workers away from other duties and may require shutting down operations while the chore is completed. Industrial dust control fans are designed to eliminate the need for this manual cleaning, effectively reducing labor costs and boosting a plant's bottom line. In some cases, the fan systems can pay for themselves in the first year of operation.



Example layout showing how a SonicAire dust control system can be implemented.

Industrial dust control fans offer a proactive solution for a wide range of manufacturing and processing industries, including wood, furniture, cabinets, paper, textiles, non-wovens, laundry, plastics, recycling, rubber and chemical operations. The versatility of the various fan models makes this an effective option for facilities of all sizes.

SonicAire's BarrierAire™ technology keeps dust at the floor level of the facility, preventing overhead dust accumulation and combustible dust cloud formation. Each system is installed based on an engineered analysis and plan for your facility (see example above). The fans can be programmed for custom rotation and oscillation ranges specific to each location, ensuring optimal performance.

Reap the Benefits of Industrial Dust Control Fan Systems

SonicAire partners with plant operators to minimize risk and enhance safety. Our proactive dust control solution is designed to prevent overhead combustible dust problems while our team delivers a customized solution for each facility that maximizes results while minimizing cost. The results are a cleaner, safer plant that enables you to maintain productivity while complying with industry regulations.

To learn more, including how an engineered dust control system may be the right solution for you and to request a free assessment, please contact SonicAire.

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