



COMBUSTIBLE DUST HANDBOOK

GreatLakesPowerVac.com

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INTRODUCTION

Thank you for downloading this E-book. It is the result of extensive research, writing and editing — tapping into the collective expertise of not only Great Lakes Power Vac professionals, but also some of the dust mitigation industry's most respected thought leaders.

Dust accumulation in an industrial facility is a serious risk. The biggest risk, obviously, is to the safety and wellbeing of your employees. A dust fire or explosion can have devastating consequences. Secondly, excessive dust accumulation can impact the financial health of an organization in many ways, from regulatory fines and stop-work orders, to product quality issues, and reductions in productivity and employee retention.

Safeguarding against these risks is entirely possible but requires commitment. Planning and prevention go a long way. A reliable dust mitigation program includes effective and well-maintained dust collection equipment, regularly scheduled cleaning, and ongoing monitoring. An effective program engages everyone working in the facility; because, combustible dust is everyone's problem.

That said, it is important to recognize that removing combustible dust from an industrial facility is not as simple as grabbing a broom or generic shop vacuum. In fact, a facility's risk level can increase when the wrong cleaning methods or equipment are used. The safe and efficient removal of combustible dust requires specialized training and equipment that not all industrial cleaning companies can provide.

While combustible dust mitigation is everyone's problem, the commitment must start at the top with company leadership. Investing in the right dust collection equipment is the first step. Developing internal processes and policies with respect to dust monitoring and cleaning is another important action to take. Hiring a reputable cleaning contractor with specialization in combustible dust removal is also essential.

Make no mistake, combustible dust presents serious risks to a wide range of industrial facilities. But when armed with the right knowledge, resources and partners, those risks can be managed. We trust that the information provided in this E-book will help you develop an effective management plan of your own.

ARE ALL TYPES OF DUST COMBUSTIBLE?

Dust can pose a serious fire risk in a variety of industrial facilities. It's important for businesses to understand the types of dust they may encounter, along with the factors that create a potentially combustible situation.

There are two broad categories of industrial dust. The first relates to dust that is a direct product of processing operations, such as in pharmaceutical or cereal manufacturing. "You normally wouldn't even call this dust; you would refer to this as powder," says Dr. Chris Cloney, Managing Director and Lead Researcher for DustEx Research, a company with worldwide focus on increasing awareness of combustible dust hazards.



Dr. Chris Cloney

The second type of dust is a byproduct of the material being processed. "As you dump, convey or process the material, it often breaks down and leaves a dust-like substance," Cloney says. This substance accumulates in and around the equipment before eventually spreading further into the facility. If left unattended, this type of dust creates significant risk for a facility.

WHAT MAKES DUST COMBUSTIBLE?

The National Fire Protection Association (NFPA) once said that in order to be combustible, dust had to be of a specific particle size: 420 microns or smaller, which is smaller than half a millimeter. That seemed to make a lot of sense. Think about firewood, for instance. A log will burn but kindling burns a lot faster. The smaller the kindling, the faster it burns.

Nowadays, however, the NFPA doesn't specify particle size. "Any particulate matter that provides a deflagration hazard is deemed combustible," Cloney points out. "This new definition has been picked up by both OSHA and the Canadian Center for Occupational Health & Safety."

WHAT MAKES DUST COMBUSTIBLE?

The fifth element of the Dust Explosion Pentagon is confinement. When a flash fire breaks out and is contained in a confined area, pressure can build up to the point that an explosion occurs. “Think of confined spaces such as hoppers, dust collectors and silos,” Cloney says.

THE CONSEQUENCES OF NON-COMPLIANCE

NFPA 652 is not a regulation. But that doesn’t mean businesses can ignore the dust hazards in their facilities.

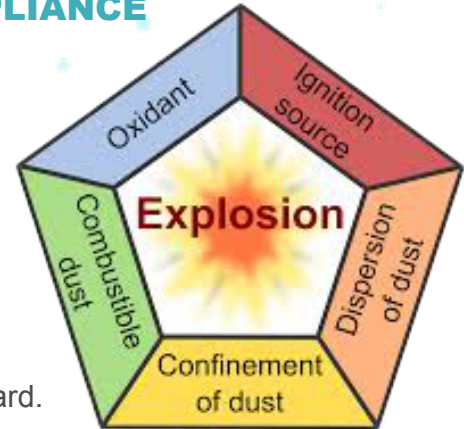
OSHA has a general-duty clause saying that employers are required to have a workplace safe from known hazards. Because NFPA has published a considerable amount of information related to combustible dust, combustible dust is a known hazard. “OSHA will often cite its general-duty clause when workplaces are not in compliance with the NFPA guidelines,” Cloney points out.

OSHA also has its Hazard Communication Standard (HCS) which outlines an employer’s responsibility to communicate hazards to workers. “There are also industry-specific guidelines OSHA has developed, such as its grain-handling standard,” Cloney says.

Another level of regulation ties to state and local jurisdictions. A state can choose to adopt OSHA’s federal regulations, adopt a state-level OSHA regulation, or develop its own regulation, perhaps through local fire or building codes.

Regardless, businesses need to know the laws they need to comply with. Failure to comply could lead to the following:

- Fines
- Stop work orders
- Inability to obtain insurance



In the event of a combustible dust fire or explosion, a business could also be exposed to various lawsuits. For example, Cloney points to a grain elevator explosion in Nebraska. The city's disaster response efforts resulted in tens of thousands of dollars in expenses. The city ended up suing the elevator owner for financial reimbursement.

OVER 300 CATASTROPHIC INCIDENTS IN NORTH AMERICA LAST YEAR ALONE

Aside from the financial repercussions of non-compliance, Cloney says businesses should first think about the human component. "What are the ramifications of not following the NFPA's guidance in the first place?" Cloney asks. The result could be something as catastrophic as an explosion that decimates an entire facility, as was the case with a sugar refinery in Port Wentworth, Georgia. More importantly, 14 people were killed and another 38 injured.

Horrible events such as that happen regularly. Cloney assembles an annual "Combustible Dust Incident Report". There were over 300 catastrophic incidents in North America last year. That's roughly six per week. Of those 300 incidents, 32 included an explosion. You can download these reports at Cloney's website, DustEx Research - Incident Database.

"We have several clients in the foundry industry, specifically those dealing with aluminum and gray iron where the dust created is highly reactive."

**- Dan Beml, General Manager for
Great Lakes Power Vac**

Combustible dust hazards can affect numerous types of industrial facilities. Great Lakes Power Vac assists in dust mitigation in a number of those settings. "We have several clients in the foundry industry, specifically those dealing with aluminum and gray iron where the dust created is highly reactive," says Dan Beml, General Manager for Great Lakes Power Vac, a Wisconsin-

based provider of industrial cleaning and environmental services since 2004. “We also work in the grain handling industries where clients are dealing with a lot of organic product and have containment structures such as silos. We also have clients in food, plastics and chemical manufacturing, as well as power generation companies and fabricators.”

In all of these industries, and many more, a variety of industrial dust is created. Not all of that dust is necessarily combustible, but there’s a good chance that it is. Waiting for a fire or explosion to happen is not the best way to find out. Businesses should heed the guidelines offered by the NFPA and begin assessing the combustible dust hazards in their facilities — before it’s too late.



DO I HAVE A COMBUSTIBLE DUST SITUATION?

According to the NFPA (National Fire Protection Association), any dust that poses a deflagration hazard, regardless of particulate size or shape, is considered combustible.

Referencing NFPA standards, OSHA has identified three types of facilities that are deemed hazardous due to the presence of combustible dust in the atmosphere:

- Metal dusts such as aluminum, magnesium and other commercial alloys
- Carbonaceous dusts that have more than 8% total entrapped volatiles, or have been sensitized by other materials so they present an explosion hazard
- Dusts emanating from flour, grain, wood, plastic and chemicals

The following list of specific products helps illustrate the wide variety of industrial facilities that could have the potential of a combustible dust fire or explosion:

- Powdered milk
- Sugar
- Coffee
- Corn meal
- Rice
- Tea
- Coal
- Pine soot
- Sulfur
- Aluminum
- Epoxy resin



OSHA provides an extensive list of products and materials that present a combustible dust explosion risk. Download OSHA Poster.

TESTING FOR DUST COMBUSTIBILITY

If you operate a facility that fits any of the above descriptions, it is time to begin taking the potential of combustible dust seriously. However, the only way to definitively conclude that a dust is combustible is to have it tested in a laboratory.

“If the dust burns exothermically, it has the potential to be a combustible dust,” says Dr. Chris Cloney.

*“If the dust burns exothermically,
it has the potential to be a combustible dust.”*
- Dr. Chris Cloney, Managing Director
and Lead Researcher for DustEx Research

The next question is whether or not the dust can burn fast enough to cause a flash fire or explosion. “I recommend putting the dust through the NFPA’s go/no-go test to see if it burns,” Cloney says.

Laboratory analysis is a particularly useful step for one simple reason: Dust you might not think is combustible could be, and conversely, dust you think is combustible might not be.

“We recently had a client in the tobacco industry,” says Ashok Dastidar, Vice President of Dust and Flammability Testing and Consulting Services at Fauske & Associates, an Illinois-based world leader in nuclear, industrial and chemical process safety. “NFPA standards suggest that tobacco has certain combustible properties. The client sent us a sample. It was a very fine dust. We tested it and it didn’t explode. If the client had assumed their dust was combustible, they may have been overly conservative in implementing an abatement plan.”



Ashok Dastidar

According to Dastidar, the process of having a dust sample tested is relatively straightforward and inexpensive. Download [How to Speak Combustible Dust Testing](#).

“The cost of having a test done is insignificant compared to the cost of installing all kinds of unnecessary protection equipment,” Dastidar points out. “Even if you look at that list of products from OSHA and assume your dust is combustible, it’s still important to have your dust tested to determine how energetic and sensitive the material is.”

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Dastidar says facilities should take dust samples from various locations:

- Dust collection equipment, i.e. cartridge filters
- Overhead bins
- Horizontal ledges
- Floor



“We recommend that material of 500 microns or smaller be tested to see if it will explode,” Dastidar says. (That’s a particle size of about half a millimeter.) Dust that comes back as non-explorable can typically be deemed lower priority and revisited later on, perhaps at an even finer dust fraction to see if a smaller particle size creates an issue.

“Dust that comes back from testing as explosible requires further testing,” Dastidar adds. “It’s much like going to the doctor for your annual checkup. You get your bloodwork done and then have your consultation. With dust testing, that first round of screening tells you there is a problem. But then you need data to solve the problem.”

For example, a corn-milling facility is placing its overly fine material into a baghouse. A sample is taken from the baghouse and sent to a lab for testing. The sample proves explosible. The facility is now required by OSHA and

the NFPA to address the hazard. In order to properly design the necessary protection systems, additional data is needed.

“You now want to have the dust tested at a level below 500 microns, perhaps at 75 microns,” Dastidar says. “This round of testing is to determine explosion severity, which relates to ASTM E1226. Additional tests will help determine how easy it is for the material to ignite.”

Dastidar says this data will help guide any outside firm hired to design and install dust mitigation equipment within the facility. Without this data, the firm could end up mis-sizing the mitigation equipment, resulting in either an inadequate level of safety, or on the other hand, an overly aggressive level of safety that leads to unnecessary added cost for the facility.

TESTING FOR DUST COMBUSTIBILITY

Another thing facilities must be aware of is the volume of dust accumulating in different areas. NFPA 654 offers guidance on dust levels.

Immediate cleaning is warranted whenever a dust layer of 1/32-inch thickness accumulates over a surface of at least 5% of the floor area. It's also important to recognize that the dust coverage area includes structures such as overhead beams and joists, ducts, the tops of equipment, and areas around any dust collection equipment installed within the facility.

IMMEDIATE CLEANING IS WARRANTED WHENEVER A DUST LAYER OF 1/32-INCH THICKNESS ACCUMULATES OVER A SURFACE OF AT LEAST 5% OF THE FLOOR AREA.

“People tend to react to the dust they see at eye level,” says Rob Towey, Operations Manager for Great Lakes Power Vac. “What you have to remember is that there is also a lot of dust accumulating above your head. Our crews will typically find a lot of dust accumulation around production lines.”

In general, any horizontal surface where dust can accumulate should be inspected. Even vertical surfaces should be looked at from time to time.

Every facility is different. Only thorough, regularly occurring inspections will help prevent dust from accumulating to an unsafe level.

“How often we’re called in to clean a facility really depends on the customer,” Towey says. “Some customers call us as soon as they start seeing a light dusting on surfaces. Others seem to wait until there is 15 years’ worth of dust on the rafters.”

Waiting 15 years is obviously not a wise idea given the tight NFPA guidance of 1/32-inch thickness. Towey says most of Great Lakes Power Vac’s customers like to adhere to a regular maintenance schedule.

“Some customers like us to clean up their dust twice a year, some prefer once a year, and others prefer every other year,” Towey says. “It all depends on the facility itself and how quickly dust tends to get airborne and accumulate. Another factor is the quality of the dust collection systems in the facility.”

A facility could be fined by its AHJ (authority having jurisdiction) if it doesn’t maintain certain housekeeping and combustible dust abatement practices, according to NFPA. It’s important to note that “smaller” accumulations of dust in isolated spots normally will not be classified as a housekeeping violation.

A FACILITY COULD BE FINED BY ITS AHJ IF IT DOESN’T MAINTAIN CERTAIN HOUSEKEEPING AND COMBUSTIBLE DUST ABATEMENT PRACTICES, ACCORDING TO NFPA.

However, it’s difficult for a facility to make this judgment call on its own since the pace of dust accumulation can be difficult to predict.

Given the seriousness of combustible dust from both a safety and financial standpoint, it makes a lot of sense for an industrial facility to get on a good housekeeping and preventive maintenance program — and stay on it.

HOW DO I REMOVE COMBUSTIBLE DUST?

The National Fire Protection Association (NFPA) offers guidance on basic housekeeping measures at a facility with dust in the atmosphere:

- Minimize escape of dust from equipment and ventilation systems
- Use dust collection systems and filters
- Inspect for dust residues at regular intervals
- Clean at regular intervals
- Use methods that don't generate dust clouds if ignition sources are present



The physical process of removing dust from an industrial facility is relatively straightforward. However, specialized equipment and operator training is often required. Perhaps the most important thing is good planning.

“We do whatever we can to work around a client’s production schedule,” says Rob Towe. “While we are capable of working during production with minimal interruption to the facility’s processes, we always like to plan things out with our client.”

“We do whatever we can to work around a client’s production schedule”

- Rob Towe, Operations Manager at Great Lakes Power Vac

Speaking of planning, Towe says facilities should take care of any issues with their dust collection equipment around the same time the cleaning crew comes in. Otherwise, the time and expense of having dust removed from the facility could be undone by the malfunctioning or underperforming of the dust collection equipment.

MAINTAINING DUST COLLECTION EQUIPMENT

The experts at J Carpenter Environmental offer some advice on how to properly maintain dust collection equipment. J Carpenter Environmental is a Wisconsin-based distributor of products and equipment for environmental protection and compliance including dust and air pollution control.

LEAK DETECTION. The first thing to do is conduct a fluorescent leak detection test. Special fluorescent powders and UV lights will help pinpoint leaks at various points in the dust collection system, i.e. seams, welds, bags and cartridges. This type of test is far more efficient and accurate than simply eyeballing it. A professional can help execute the test if you want some help.

CONFIRM PROPER COMPRESSED AIR FUNCTION. If your facility has a pulse jet dust collector, compressed air is used to clean the filters. Be sure to inspect the valves and hoses in the system because they can become damaged and begin leaking. When the cleaning system pulses, visually confirm that all valves work at the same time. Also ensure that all valves open and close all the way. Finally, make sure hoses aren't coming loose or showing excessive wear which could result in a leak.

SEALS AND GASKETS. Dust collection systems often have door seals. The gasket around the edges of the door can wear out. If the door no longer seals properly, you'll run into problems. Open the doors and inspect the gaskets, replacing as needed. Additionally, most dust collection systems have an airlock. It is best practice to either repair, rebuild or replace the airlock annually to help keep the system running at peak efficiency.

FAN. The fan is a crucial part of the dust collection system, so giving it some attention is also highly recommended. We are talking about bearing lubrication, belt inspection, and ensuring that the fan impeller is properly balanced.

WHEN IT'S TIME TO CLEAN, VACUUMING IS PREFERRED

When your dust collection system is in good working order, it's time to press forward with the facility cleaning phase.

OSHA states that vacuuming is the preferred method of removing dust from a facility. Vacuuming stirs up little to no dust which prevents areas that were just cleaned from having more dust thrown back on them. Safety is

also enhanced. Remember, dust dispersion into the air is one of the five ingredients of the Dust Explosion Pentagon. Vacuuming results in little to no dust dispersion.

The vacuum cleaners themselves should meet certain requirements in order to ensure the safest, most effective dust removal job possible.

For instance:

- Made of certain materials that comply with other NFPA standards
- Hoses should be conductive or static-dissipative
- All other conductive components, including wands and attachments, should be bonded and grounded
- Dust-laden air should not be allowed to pass through the fan or blower
- Electrical motors should generally not be in the dust-laden air stream
- When liquids or wet material are being vacuumed, paper filter elements should not be used
- Personnel performing the work may need to be grounded



ONE CLEANING METHOD A FACILITY SHOULD ALWAYS TRY TO AVOID IS BLOWING. BLOWING STIRS UP A LOT OF DUST WHICH IMPACTS BOTH EFFICIENCY AND SAFETY.

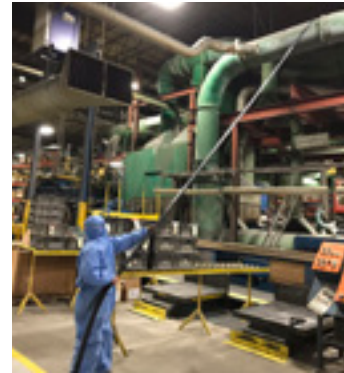
If vacuuming isn't possible, sweeping or washing down the dust are considered acceptable methods, although neither is as efficient as vacuuming.

One cleaning method a facility should always try to avoid is blowing. Blowing stirs up a lot of dust which impacts both efficiency and safety. The only circumstances in which blowing should be considered are when areas needing to be cleaned are inaccessible by the preferred cleaning methods, or when the preferred methods create a safety risk.

KEYS TO AN EFFECTIVE CLEANING PROCESS

In addition to using the right type of cleaning equipment, it's also important for cleaning personnel to follow the right process.

"We like to work from the top down," Towey says. "We start vacuuming at the highest levels of the facility, typically the rafters, and then finish up at ground level. If you work the opposite way, you're just going to knock dust down onto the areas you just cleaned."



The dimensions and overall layout of a facility can vary widely from one to the next. This is why a pre-site visit is an essential step in the dust removal process.

"We'll often run into challenges with accessing certain areas of a facility," Towey relates. For instance, some facilities provide easy catwalk access to the rafters while others do not. Also, cranes and man cages can sometimes be used, whereas scissors or boom lifts might be needed in other instances.

A PRE-SITE VISIT IS AN ESSENTIAL STEP IN THE DUST REMOVAL PROCESS

"Every facility is going to be different," Towey reminds. "That's why we like to go in and take a look around. Then we can come up with a plan as to how we're going to tackle the cleaning."

Once the plan is laid out and the cleaning event actually takes place, the dust needs to be disposed of. How a facility goes about this will also vary.

"Many times, the facilities themselves take care of disposal," Towey says. For instance, they may already have a profile set up at a landfill. Other times, the service provider can set up a profile at a landfill and take care of the disposal.

For this reason, the method of disposal is for the facility and service provider to work out between themselves. Regardless of which method is decided upon, the dust will need to be disposed of legally, safely and efficiently. Most importantly, it will no longer be creating a significant safety risk in the facility.

THE RIGHT EQUIPMENT FOR COMBUSTIBLE DUST REMOVAL

A variety of equipment is needed to safely and efficiently remove combustible dust from an industrial facility. Since vacuuming is the OSHA and NFPA recommended method for removing dust, vacuuming equipment is obviously at the top of the list. Dust removal crews also need vacuum accessories, such as hoses, wands, and nozzles, as well as aerial lifts to help workers access places like rafters and ductwork.



“The main thing to keep in mind is that any piece of equipment must be compatible with the media being vacuumed and the environment it will be working in,” says Rob Towey.

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The National Fire Protection Association (NFPA) has created numerous hazard classifications for industrial facilities. The classifications also have subsets that are referred to as divisions. Class II refers to locations where combustible dust is likely to exist. Division 1 denotes areas where a dangerous level of dust is likely to exist during normal operations. With Division 2 areas, it is not expected that normal operations will generate a dangerous level of combustible dust; but, the dust is still present on surfaces in the area, and will require special equipment and attentive care.

KEYS TO AN EFFECTIVE CLEANING PROCESS

In combustible dust mitigation, there is a concept known as the Dust Explosion Pentagon. When all five elements converge, there is a strong possibility that a combustible dust cloud explosion could occur. Those five elements are:

- Fuel (dust)
- Oxidizer (oxygen in the air)
- Ignition Source (i.e. spark, flame, hot screw)
- Dispersion
- Confinement

Dust removal equipment must be designed in such a way that the possibility of introducing an ignition source is eliminated.

Compatible, electrically operated vacuum equipment typically carries a

Class II, Division 2 rating. These vacuums are independently tested and found to be suitable for use in hazardous locations. They feature fully grounded, static-dissipating designs and do not have internal brushes or switches, so there is no risk of arcs or sparks that might ignite the dust cloud created inside the vacuum or an external combustible dust cloud.

Another option is using a pneumatically operated vacuum. This type of vacuum is powered by air, as opposed to electricity, so the risk of arcs and sparks is eliminated.

For cleaning the high-reaching areas of a facility, crews must often utilize an aerial lift. Lifts are also rated for different types of hazardous environments. “For a Division 1 area, you need an EX-rated lift, whereas a Division 2 area requires an EE-rated lift,” Towey says.

The bottom line is that an industrial facility with combustible dust should seek a cleaning services provider that understands hazardous locations and can remove the dust as thoroughly, efficiently and safely as possible — with minimal disruption to the facility’s operations.



HIGHLY EFFICIENT DUST REMOVAL EQUIPMENT

For high volumes of dust, rather than drag small, portable vacuuming units around a facility, a Great Lakes Power Vac crew often utilizes a heavy duty vacuum truck that is parked outside. Hoses are run into the facility for the crew to do its work. This provides several advantages from both a safety and efficiency standpoint.



“Our vac trucks meet several NFPA hazard classifications because they are not in proximity to the work being done,” Towey points out. “We just need to make sure we are utilizing hoses and cleaning tools that are rated for a Class II, Division 2 atmosphere.”

With a portable vacuuming unit, the entire unit must be rated for the environment it is working in because the unit itself is right there in the dust zone. With a vac truck, it’s a different story.

“With our vac truck, the hoses and tools are either groundable and bondable, or static-dissipating,” Towey says. “Generally speaking, you have to use either metal hoses and pipes, or a rubber hose that is impregnated with carbon black to make it static-dissipating. To further enhance safety, our crews use an ohmmeter to ensure that we have proper connections, grounds and bonds throughout the entire system.”

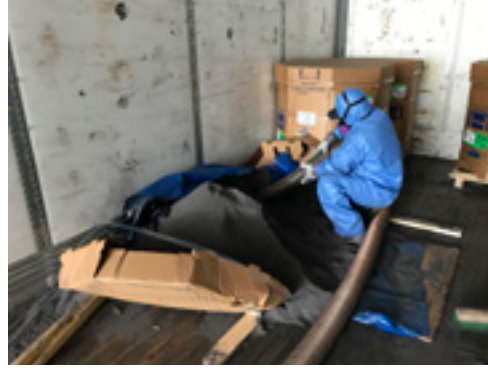
WHEN IT COMES TO COMBUSTIBLE DUST REMOVAL, SAFETY IS DEFINITELY NOT A PLACE TO START CUTTING CORNERS

Towey adds a word of caution with respect to vacuum hoses.

“Some cleaning contractors like to use plastic drain tile hose. It may seem like a good option because it’s inexpensive, light and easy to work with. But it should not be used in a combustible dust environment; because, it is not groundable or static-dissipating,” Towey says.

When it comes to combustible dust removal, safety is definitely not a place to start cutting corners. As the saying goes: Safety First. Then, efficiency is a close second. Vac trucks have an advantage here, as well.

Many portable dust vacuums have a collection capacity of roughly 10 gallons. That can be adequate for smaller, more localized cleanup efforts. “If there is just a small amount of dust up on some rafters, it might not be cost-effective to bring in a big vac truck,” Towey says.



But for facilities that require larger-scale cleaning, a vac truck provides a better solution.

“The vacuuming rate is much higher with a vac truck,” says Dan Bemis, General Manager for Great Lakes Power Vac. In fact, the company’s vac truck typically pulls at nearly 10x the rate of the typical portable vacuum.

“Smaller, portable vacuum units operate at a much lower negative pressure,” Bemis explains. “Our vac truck is pulling at such a high negative that it is much more efficient. That extra pulling power also helps keep dust from accidentally getting dispersed by the cleaning tools.”

Imagine a Shop-Vac being used to clean a rafter with 6 inches of dust. As the cleaning attachment is being used along the rafter, some of the dust is going to fall off. But there isn’t enough vacuuming power to catch that falling dust.

“With our vac truck, on the other hand, it is pulling so hard that most falling dust gets sucked right back into the hose,” Bemis points out.

With all of that dust getting sucked up, where does it go? In the case of Great Lakes Power Vac, it lands directly in the massive holding tank on the vacuum truck parked outside of the facility. The tank holds over 10 cubic yards of material, which saves crews a lot of downtime spent emptying portable vacuum cleaner tanks or changing bags. That helps cleanup jobs go much faster — something any industrial facility will appreciate.

When vacuuming in hazardous locations, other equipment considerations can include; use of non-sparking or groundable vacuum tooling (wands, brushes, nozzles, crevice attachments, etc.), the use of personnel grounding straps, and even the type of clothing worn by the personnel (i.e. use of non-static generating materials versus synthetic plastic materials). In some cases

(certain metal dusts, gunpowder, toner, solid rocket propellants), the use of specialized liquid recovery vacuums that deposit the dust into a suitable liquid holding tank are the best solution.

**YOU CAN'T BE TOO SAFE WHEN
WORKING IN HAZARDOUS LOCATIONS.
ONE MISTAKE CAN RESULT IN
DEVASTATING OUTCOMES.**

In summary, if you intend to use a contractor for removing your combustible dust, be sure to carefully ascertain their familiarity with safe cleaning principles and methods and ask for references and other direct evidence of their experience cleaning combustible dust. You can't be too safe when working in hazardous locations. One mistake can result in devastating outcomes.

MONITORING DUST AFTER CLEANING

The pace of dust accumulation in a facility can vary greatly. Influential factors include the type and volume of material being processed, as well as the effectiveness of any dust collection equipment installed within the facility.

According to Ashok Dastidar, Vice President of Dust and Flammability Testing at

Fauske & Associates, another key factor is the tendency of the processing operation to “leak” dust into the facility.

“For example, some facilities have mixing or bag dump stations that do not include air sweeps, which are designed to draw away fugitive material,” Dastidar relates. “Additionally, some facilities have sampling ports in the ductwork. These ports are designed to be tightened down. But after years of operation and sometimes improper employee training, the ports are not tightened down every time. You end up with material escaping from the process.”



“An audit will help determine how the facility should set up its housekeeping protocols.”

- Ashok Dastidar, Fauske & Associates

Depending on the rate of escape, Dastidar says it might take a year for enough dust to accumulate to a level that requires another thorough cleaning. On the other hand, it may take just a few hours. That’s why Dastidar says it’s a smart idea to have a trained professional come in and conduct an audit. “An audit will help determine how the facility should set up its housekeeping protocols,” Dastidar says.

WHERE AND HOW TO MONITOR DUST BUILDUP

The National Fire Protection Association (NFPA) offers guidance on dust levels. NFPA 654 says immediate cleaning is warranted whenever a dust layer of 1/32-inch thickness accumulates over a surface of at least 5% of the floor area.



“That 1/32-inch standard is based on a standard material density,” Dastidar points out.

“If you have a lighter and fluffier material, the standard might be 1/8-inch. Regardless, it isn’t very much. A good rule of thumb is that if you can write your name in the dust, it is too much dust.”

“A good rule of thumb is that if you can write your name in the dust, it is too much dust.”

- Ashok Dastidar, Fauske & Associates

“Another good rule of thumb is dust accumulation that is roughly the thickness of a paper clip,” says Rob Towey.

To monitor dust accumulation, facilities want to look closely at horizontal surfaces and overhead surfaces.

“Simple visual checks are very important,” Dastidar says. “If you see dust accumulating somewhere, note it.”

Dastidar says a good best practice is to set out trays in different locations throughout the facility. Those trays can contain inside markings to help measure the rate of dust accumulation. The trays should be checked weekly at first, and perhaps monthly if the rate of accumulation proves relatively slow. “From there you can back-calculate how long it generally takes for dust to accumulate to the point that it needs cleaning per the recommended standards,” Dastidar says.

It’s important to recognize that the dust coverage area includes the tops of equipment, areas around any dust collection equipment, ducts, and structures such as overhead beams and joists.

“To properly assess dust accumulation in many of those overhead areas, there needs to be close-proximity inspections using a manlift to get elevated to the proper height,” Towey points out.

HOW CAN WE SLOW THE BUILDUP OF DUST?

According to Dastidar, the biggest thing a facility can do is “tighten up” its processing equipment to eliminate any dust escape points. All seams and connection points should be inspected for loose fittings and gaps.

THE BIGGEST THING A FACILITY CAN DO IS “TIGHTEN UP” ITS PROCESSING EQUIPMENT TO ELIMINATE ANY DUST ESCAPE POINTS.

The next thing a facility should do is develop a thorough housekeeping regimen. In other words, cleaning up dust can't be completely avoided. But if cleaning can become part of a more proactive standard operating procedure, facilities can optimize both efficiency and cost.

“Ongoing housekeeping is going to be key,” Dastidar points out. “Sweeping is sort of frowned upon, but not unreasonable. Just make sure you're using something that is anti-static and contains natural bristle brushes. Also, avoid vigorous sweeping because gentle sweeping will do. When that can't be accomplished, vacuuming is the best option.”

Industrial cleaning companies like Great Lakes Power Vac can assist facilities in not only the physical work of vacuuming, but also in determining the best equipment for the job at hand.

Frequency of cleaning will depend on the facility and its unique rate of dust accumulation. “Regardless, a facility needs a documented housekeeping program,” Dastidar says. “We tell our clients that their housekeeping program should be just as rigorous as their ISO 9001 QMS program.”



An effective dust cleaning program does not need to be complicated. However, it does need to be documented — and employees need to be trained on it.

“The documentation must be accessible and comprehensible for all custodial staff,” Dastidar says. “Documentation should explain the proper way to inspect for dust, as well as how to sweep, vacuum and wash-down dust.

“Training is the other part,” Dastidar continues. “There must be two levels of training. One is for custodial staff so they know the proper methods for cleaning. The other is general awareness training for all employees. All employees must understand the general concept of dust hazards in the workplace. Employees should also be trained on their important role in the dust management process. Having extra sets of eyes on the problem is

THE BOTTOM LINE IS THAT DUST IS EVERYONE’S PROBLEM — AND IT SHOULD BE EVERYONE’S PROBLEM TO HELP SOLVE.

a huge help. For instance, an employee on the production line might see material leaking from the system. That employee should understand how important it is to report this to custodial staff so it can be addressed.”

The bottom line is that dust is everyone’s problem — and it should be everyone’s problem to help solve.

ASSESSING DUST HAZARDS IN A FACILITY

The NFPA outlines a 7-step Dust Hazard Analysis (DHA) process for facilities to follow on an ongoing basis.

1. ACQUIRE DOCUMENTATION – Thorough documentation helps facility staff gain an understanding of the facility’s inherent risks. Useful documentation includes building plans, piping and instrumentation diagrams, process flow maps, electrical hazard classification drawings, etc.

2. FIELD-VERIFY THE DOCUMENTATION – This step is especially important in older facilities where some of the above documentation may be outdated or incomplete.

3. ASSEMBLE THE DHA TEAM – This isn't a "go through the motions" exercise. Make sure a qualified person is leading an engaged team that includes plant managers, engineers and maintenance personnel, and perhaps even a consultant specializing in combustible dust management.

4. IDENTIFY HAZARDS AND EVALUATE COMPLIANCE – Every point in the facility's operational process must be scrutinized for potential hazards. Those findings must then be documented. Additionally, potential corrective measures should be identified, and existing measures should be re-evaluated.

5. PRIORITIZE THE HAZARDS – This way the hazards that pose the most risk will be corrected first.

6. DOCUMENT THE RESULTS – This is important for not only your company's internal understanding, but also in the event that the facility ever undergoes an inspection. An AHJ (authority having jurisdiction) will likely want to see any documentation you have regarding dust abatement processes.

7. REPEAT – Combustible dust management is not a "one and done" event. Ongoing attention is required to maintain a safe and compliant facility.

HOW COMBUSTIBLE DUST PREVENTIVE MAINTENANCE SAVES MONEY & REDUCES RISK

REDUCE RISK AND COST, IMPROVE SAFETY AND PRODUCTIVITY

When your car reaches 3,000 miles, you get an oil change. You proactively keep up on the maintenance on your factory's machines. You follow the maintenance schedule for your facility's forklift. The same level of proactive preventive maintenance should apply to keeping up with the dust in your building.



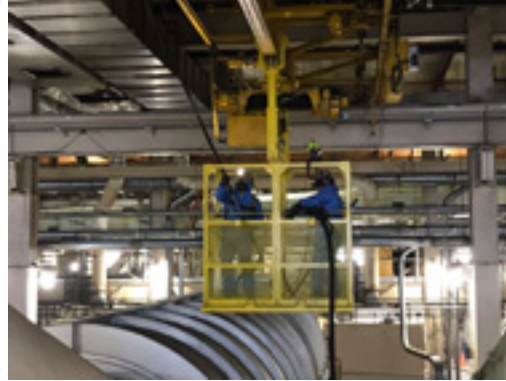
Some facility owners misguidedly view preventive maintenance as an optional cost, prompting them to stretch out their cleaning intervals much longer than they should. This approach not only raises the risk level related to combustible dusts but can also lead to a loss of productivity and increased overall cleaning costs.

“Ongoing maintenance helps keep a facility clean, and that helps keep a facility safe and productive.”

- Rob Towey, Great Lakes Power Vac

“Ongoing maintenance helps keep a facility clean, and that helps keep a facility safe and productive,” says Rob Towey. “If you don’t have combustible dust covering the surfaces in the facility, there is less of a chance for conflagration. Regular cleaning is also more cost-effective for the facility.”

It is easier and less time-consuming to vacuum lower levels of dust. If you only clean a facility every four or five years, the dust removal crew could end up dealing with massive buildups that can actually take more time and cost more money to remove.”



More regular cleanings also provide opportunities to discover problem areas. Because cleaning crews are onsite more often, they are more regularly inspecting things like dust collection equipment and ductwork, which can often be the source of fugitive dust. This increases the likelihood of identifying a problem area early on, which ultimately helps slow the ongoing accumulation of dust. Slower accumulation could eventually lead to longer maintenance intervals, which could help the facility save money over time.

Another benefit of more frequent cleaning relates to employee job satisfaction. “A cleaner facility is a better facility to work in,” Towey says. “That helps attract and retain employees.”

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“The facility’s customers can come to appreciate this, too,” Dan Bemis adds. “If a client ever comes in to tour a facility, what will they think if that facility is a dusty mess? They’ll probably wonder if some of that dust is getting into whatever product is being manufactured for them. They might even have it in the back of their minds that the facility could end up getting shut down, or worse yet, suffer an explosion and be forced out of operation.”

All of these risks can easily be managed with a simple, cost-effective preventive maintenance program.

SMART SCHEDULING THAT SPARES PRODUCTION

One challenge preventive maintenance can present is disruption to a facility's operations. It's important for a facility's management to work closely with their dust removal provider to plan a smart cleaning schedule.

In the planning stage of a dust removal project, Towey says GLPV works with the customer to design a plan that best works for the customer's production schedule. Working while a facility is still in operation is entirely possible, and quite common, Towey notes. If the logistics of the facility's operations allows for the service provider to clean while production continues, this may be the most cost-effective option. Often, however, it is not feasible or efficient to clean while production is ongoing.

"Having hoses running across aiseways can be disruptive to forklift and foot traffic. It is also not always prudent to clean areas above where people are working," Towey says.

A SERVICE PROVIDER WILL OFTEN COORDINATE WITH THE CUSTOMER TO PERFORM THE CLEANING DURING OFF-HOURS.

Because of these and other challenges what may be disruptive to a company's operations, a service provider will often coordinate with the customer to perform the cleaning during off-hours. For example, dust removal services could be scheduled on weekends when the facility is not operating, or during periods of planned shutdowns. This allows the service provider unfettered access to the areas that need to be cleaned, which is often more efficient for both parties.

Managing the timing of a cleaning often comes down to strong communication between the facility and the dust removal company.

PROFESSIONAL GUIDANCE

When the facility and service provider begin planning their preventive maintenance schedule, they should look to the National Fire Protection Association (NFPA) for standards and guidance to help manage combustible

dust explosion risks. Part of that guidance includes the completion of a dust hazard analysis (DHA) every five years, with the first one being completed by September 7, 2020. Led by someone with expertise in combustible dust management, a DHA seeks to identify dust hazards within the facility, evaluate existing safeguards, and recommend where additional safeguards should be implemented.

One essential safeguard is a customized preventive maintenance plan.

“Completing a dust hazard analysis is the first step,” says Dan Bemis. “From there it is important for industrial facilities to implement the necessary processes and safeguards to monitor and manage dust — and then track and maintain their effectiveness.”

TIPS FOR MONITORING DUST BUILDUP

As a general rule, an industrial facility does not want more than a 1/32-inch layer of dust on a surface. If that dust were to get blown around, it could create an ignitable dust cloud. It is important for facilities to continually monitor dust accumulations and call a reputable dust removal company before that accumulation reaches a potentially dangerous level.



After a service provider comes in and rids the facility of combustible dust, the process of monitoring and prevention starts all over again.

“After one of our crews has completed a thorough cleaning of a facility, we work with the client to identify areas of the facility that had the greatest amounts of dust,” Bemis says. “Then we can establish a dust monitoring procedure for those areas. It is important to continue monitoring these higher-risk areas on a regular basis because they are going to need cleaning the most frequently. But once our crew leaves, it is up to the facility staff to continue the monitoring.”

A simple, but effective method for monitoring dust is to set out trays or shallow pans to catch dust in various parts of the facility, particularly the higher-risk areas. Employees of the facility should regularly monitor these trays, along with overhead structures such as rafters, ductwork and the tops of equipment.

This will help establish a baseline estimate as to how long it takes for an unacceptable level of dust to accumulate. That estimate can help determine a proper preventive maintenance schedule for different parts of the facility.

It is also important to search for the root causes of rapid dust accumulation, such as leaky ductwork or equipment.

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“Sometimes the majority of the dust making its way into a facility is coming from a single piece of equipment,” Bemis points out. “An effective preventive maintenance measure could be to construct some kind of enclosure around that equipment to help contain the dust. Installing a localized dust collection system in a higher-risk area is also an effective measure.”

Finding these root causes of dust accumulations is only one benefit from implementing a preventive maintenance plan. When facilities and dust removal companies work together to develop a customized plan, preventive maintenance is an important safeguard that can help control costs, drive productivity, increase product quality, and reduce the safety risks of combustible dust.



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