

# OSHA and Combustible Dust: Standards and Solutions

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## Combustible dust characteristics

The risks of combustible dust are not new. But the dangers are still very real. Truth be told, the dangers can be dramatically reduced, if not virtually eliminated. However, there is a knowledge gap – either because of a lack of concern or a lot of confusion.

I hope to fill that gap by outlining the main problems with controlling dust, the regulations that matter most, and by providing an overview of real-world solutions that could provide the best dust control for your business.

First, let's identify where the problems develop. This by itself should bust the myth that it is acceptable to do nothing.

### The Dangers of Dust: What Can You Control?

It is important to start at the beginning. Take a look at the pentagram of Diagram 1, the model of conflagration most commonly used to explain the triggers for combustible dust explosions. This model identifies the five causes for such an explosion:

1. Fuel - or the combustible dust itself
2. Oxygen – in the air
3. Ignition Source – heat in electrical equipment, smoking, wiring, static electricity, etc.
4. Dispersion – the amount of dust moving through a set area
5. Confinement - for example, the building itself

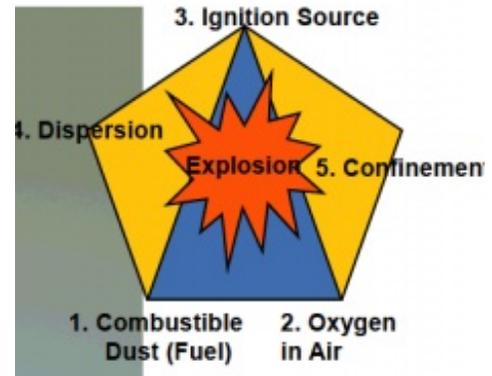
This diagram is helpful in that it clarifies the possible cause, or combination of causes. The logic is that eliminating one or more of these causes would lower the risk of an explosion. So, let's look at the real world and think about what you can really control or eliminate. You can't eliminate oxygen – you and your employees have to breathe. You can't eliminate confinement - that's where the work happens, and without that there is no product or business. And you can only eliminate dispersion as a variable by eliminating the combustible dust itself.

So that means that the only factors you can control are the fuel (the combustible dust) and the ignition source (the generation of extra heat from equipment that eventually degrades or breaks down without anyone maintaining it properly).

Let's face it: equipment breaks down and maintenance mistakes happen. It's the inevitable factor of human behavior, which, by its very definition, is always flawed. We don't live in a perfect world. This process of elimination demonstrates that the most logical factor to wrestle with - and to manage effectively - is to control the accumulation of the combustible dust. This is exactly why the regulations spend so much time dealing with housekeeping issues: you simply must find a way to eliminate the accumulated fugitive dust or you risk your employees' safety. Here's a quick look at the recent history.

### Brief Review of Regulations

Back in 2003, there were three catastrophic dust explosions that killed 14 workers. Subsequently, the



Chemical Safety and Hazard Investigation Board (CSB) issued a report identifying 285 separate combustible dust incidents between 1980 and 2005 that killed 119 and injured 718. The CSB's conclusion was far-reaching for all industries: "Combustible dust explosions are a serious hazard in American industry." CSB then recommended that OSHA issue a standard of tolerance for combustible dust accumulation based on National Fire Protection Association (NFPA) standards. The document for all industries is NFPA 654: Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids.

Precipitated by a lethal combustible dust explosion at a sugar plant in 2008, Congress then issued HR 5522, sponsored by the U.S. House of Representatives, requiring OSHA to enforce NFPA 654 Standards in a systematic and rigorous way. OSHA took this directive and established a National Emphasis Program (NEP), levying stiff fines to those out of compliance.

A new bill, HR 691, was then introduced in February 2013, and represented new momentum to OSHA's activities because legislators were not satisfied with the progress made from HR 5522. H.R. 691 was then referred to Subcommittee on Workforce Protection on April 2013, and tabled in committee early this year. But that doesn't mean OSHA has stopped its fines for non-compliance of standards already in place.

### **NFPA Standards Become OSHA Regulations**

Compliance to OSHA regulations on combustible dust is critical to employee safety. But it can be daunting to unearth, and then fully implement the appropriate standards, regulations, and rulings that matter most. So here are the essentials for you to consider.

OSHA compliance is premised on adherence to standards recommended by experts, like the National Fire Protection Association (NFPA) and the Chemical Safety Board (CSB). Make sure you have a strong working knowledge of the standards for your industry.

- NFPA 654: Standard for the Prevention of Fires (?) and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible (This is the umbrella standards used across a variety of industries)
- NFPA 664: Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
- NFPA 61: Standard for the Prevention of Fires and Explosions in Agricultural and Food Processing Facilities
- NFPA 484: Standard for Combustible Metals
- NFPA 655: Standard for Prevention of Sulfur Fires and Explosions

NFPA also issues NFPA 70: National Electrical Code, with useful information. Visit [www.nfpa.org](http://www.nfpa.org) for a copy of the standard(s) that best fits your business.

Also, be sure to take note of Specific OSHA violations cited under their General Industry General Duty Clause found in:

- 29 CFR 1910.22 — General Requirements: Housekeeping
- 29 CFR 1910.38 — Emergency Action Plans
- 29 CFR 1910.94 — Ventilation
- 29 CFR 1910.197 — Spray Finishing Using Flammable and Combustible Materials

These are all safety standards related to different facets of dealing with combustible dust, and must be considered as part of your company's Risk Assessment Checklist and/or Combustible Dust Safety Checklist. Now, remember that OSHA does not have a specific combustible dust standard, but a new rule for combustible dust is on the agency's standard-setting agenda.

To help guide what matters most, let's take a closer look at some of the specifics of NFPA 654.

NFPA 654 has a strict standard for dust buildup:

- Chapter 6.1.3.1: “The layer depth ... [is] 1/32 in. (0.8mm)....” (Author’s emphasis) This is about the size of a paper clip’s diameter.
- Section D.2. (2-4) identifies another requirement: “The dust layer is capable of creating a hazardous condition if it exceeds five percent of the building floor area. Dust accumulation on overhead beams and joists contributes significantly to the secondary dust cloud...”

These requirements mean there is essentially a zero-tolerance approach to dust buildup. What is the remedy? It is referenced in this NFPA 654 requirement:

- Chapter 8.2.1.1 “...the housekeeping frequency shall be established to ensure that the accumulated dust levels on walls, floors, and horizontal surfaces such as equipment, ducts, pipes, hoods, ledges, beams and above suspended ceilings and other concealed surfaces, such as the interior of electrical enclosures, does not exceed the threshold dust mass/accumulation.”

Clearly, the need is for frequent and regular cleaning. But how can that be accomplished?

### **Managed vs. Engineered Approaches: What are the differences?**

There are two different strategies to address OSHA’s concerns: a managed solution or an engineered solution. In fact, the NFPA Standards refer to a managed solution, which has been the status quo. But let’s take a look at each approach and its strengths and weaknesses.

A managed approach means that personnel or third party businesses clean the overhead structures on a continuing basis. This has been the conventional approach to controlling combustible dust. One benefit of a managed approach is that there are low upfront costs: contracts are set up for ongoing payments that become part of annual operating expenses.

There are also other issues to consider with a managed approach, however.

- The levels of clean in the facility vary depending on the cleaning cycle. For example, if overhead cleaning is scheduled monthly on the 30th of the month, the combustible dust has had time to accumulate by the 29th of the month, making it possible for the plant to be out of compliance with OSHA regulations...and risk the safety of the employees. So even if a plant owner/manager were not inclined to procrastinate the cleaning, the cyclical nature of the buildup is inevitable with a managed approach.
- Personnel are subjected to risks with manual overhead cleaning: The only way they can clean joists, ductwork, etc. is to be lifted to the ceiling levels by scissor lifts or other equipment.
- Also inevitable is lost production due to the necessary shutdown of the plant.

An engineered approach contrasts a managed approach, where personnel or third party business manually clean the accumulated dust on an ongoing basis. An engineered approach relies on technology to solve the problem of accumulated dust.

Within this approach are two types of technological applications:

1. Localized filtration – captures the combustible dust by either vacuuming or suctioning. This technology is often needed, but the reality is that it can’t be used alone. The hard-core truth is that localized filtration can’t capture every particle.
2. Barrier technology - prevents combustible dust from accumulating on overhead structures with an enterprise-wide system of high air mass, high velocity, and robotically-controlled clean fans. With this approach, there is a one-time deep clean of fugitive dust in overhead areas, and once that dust is removed, new dust doesn’t accumulate again.

Often there is synergy between the filtration and the barrier technologies for enterprise-wide compliance, since they can be effectively used together in one facility.

With either engineered approach, there are higher, one-time costs for implementation. These are one-time

costs, though. An engineered approach also allows for automated, controlled cleaning that doesn't interfere with production. Depending on the sophistication of the specific technology, it also delivers consistently higher levels of clean for ongoing compliance to government regulations and for employee safety.

### **When is a Managed Approach a Smart Solution?**

There is a range of business scenarios where a managed approach is the most cost-effective solution to combustible dust and fiber. Take a look at this checklist to see if any of these criteria fit your business:

- You have a plant that is less than 2000 sq ft.
- Your overhead roof structures are less than 14 ft and are convenient to reach.
- You have an owner that is willing to clean the area himself/herself.
- Your processes (whatever they may be to generate your product) do not generate more than 1/16 in. dust in a year.
- Your facility operates just eight hours a day, five days a week, and you can clean over the weekend without loss of production.
- Your building allows access to all areas where dust particulates can accumulate (e.g. no equipment in the way to reach overhead structure)

### **When is an Engineered Approach the Smart Solution?**

The reality is that the bigger the business, the more an engineered approach makes the most sense. The most compelling argument for an engineered approach is that a one-time investment delivers a lifetime of clean, assuring OSHA compliance. Other criteria that can guide decision-making for an engineered approach is in this checklist:

- Your plant is larger, with a minimum of 2500 sq ft.
- Your overhead roof structures are more than 14 ft, making it more dangerous for your employees to clean on an ongoing basis.
- Your plant generates more than 1/16 in. dust in a year.
- Your facility operates more than eight hours a day, five days a week.
- Your plant operates with second shifts.
- The stationary equipment in your building is an obstacle to manually reach overhead structures.
- Your business can cash flow a one-time capital investment that will be amortized in as little as one year.

### **Criteria for Determining the Best Solution for You**

Facility managers and plant owners should evaluate the overall cost for any solutions to achieve continuous OSHA compliance based on this general range of variables including the criteria of:

- Initial cost
- Operating costs
- Ongoing labor cost
- Employee morale
- Disruption to normal production
- Energy usage

Running a successful business requires solutions that deliver an acceptable ROI. The cost of controlling combustible dust tends to be measured in dollars and cents, which, of course, must be counted. But the cost of controlling the dangers has to be measured in another way too: Nothing is more important than protecting the lives of your employees.

*Brad Carr is president of SonicAire, Inc., Winston-Salem, NC, and has had numerous invitations to speak on safety issues with combustible dust at events in a wide range of industries. Carr has also published many articles on this topic. For a special report specific to your industry, contact [moreinfo@sonicaire.com](mailto:moreinfo@sonicaire.com) or call 336.712.2437.*

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