

Managing Combustible Dust Risks in Industrial Facilities

Key steps to identify, assess and manage combustible dust hazards in manufacturing and processing environments.

BY CHRIS WEST

Combustible dust poses a significant threat in many industrial settings, where everyday operations can inadvertently create conditions ripe for fire or explosion. Occupational health and safety professionals serve as a bridge between internal teams and external experts to develop a cohesive strategy for managing combustible dust risks. This collaborative approach helps ensure compliance, optimize safety practices and reduce the likelihood of dust-related incidents.

This article outlines key steps to identify, assess and manage combustible dust hazards in manufacturing and processing environments.

Understanding Combustible Dust Explosions

A dust explosion occurs when five critical elements come together: oxygen, heat (ignition source), fuel (combustible dust), dispersion of dust particles and confinement. This combination can lead to a rapid increase in pressure and energy release, causing high temperatures and generating gases. Dust explosions often happen in two phases:

- 1. Primary explosion:** An isolated event, where a dust cloud ignites and causes a blast.
- 2. Secondary explosion:** Triggered by the primary explosion disturbing dust accumulated on surfaces, leading to a more extensive and damaging event.

Understanding this phenomenon helps safety professionals recognize warning signs and take preventive measures.

Determining Combustible Dust Risk

Different facilities generate various types of combustible dust, such as food ingredients, metals, plastics, wood and more. Identifying whether dust is combustible is crucial. The National Fire Protection Association (NFPA) emphasizes a comprehensive dust testing procedure that determines Kst (dust cloud deflagration index), Pmax (maximum deflagration pressure), MEC (minimum explosible concentration), MIE (minimum ignition energy) and MIT (minimum ignition



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temperature). Dust with a Kst greater than zero is considered explosible. Testing dust in accordance with ASTM standards is essential to determine its Kst and Pmax values.

Conducting a Combustible Dust Hazard Analysis

The NFPA mandates a dust hazard analysis (DHA) to evaluate fire, flash fire and explosion risks associated with dust-producing activities. Facility operators can perform the analysis internally or hire a consultant, but in both cases the findings must be reviewed by authorities having jurisdiction (AHJ). The analysis identifies potential hazards, recommends safety measures, and ensures compliance with fire codes and insurance requirements.

The DHA process includes:

- **Pre-analysis preparation:** Gather necessary documents and safety data sheets.
- **Identifying dust sources:** Include common machinery and processes.
- **Risk assessment:** Prioritize hazards based on explosion potential.
- **Implementing mitigations:** Describe

how to use control measures effectively.

- **Documentation and reporting:** Ensure thorough record-keeping and compliance.

Introducing a Risk Management Framework

Implementing a risk management framework is essential for maintaining safety in environments where dust explosions are a potential threat. This systematic approach helps organizations proactively identify, evaluate, control, monitor and review risks associated with dust accumulation and ignition.

Spotting Combustible Dust Hazards

Identifying potential sources of dust generation within your facility involves conducting a thorough inspection of all areas where dust can be produced, accumulated or dispersed. Document all identified sources systematically, noting the specific equipment or processes involved. Also, look for potential ignition sources, such as friction heat generated from equipment, open flames and smoking, sparks result-

ing from static electricity, faulty wiring and malfunctioning electrical components.

Another critical factor to consider is dust accumulation. A dust layer even as thin as 1/32 of an inch, roughly the thickness of a dime, can pose a significant hazard. Therefore, it is essential to regularly monitor dust accumulation, particularly in hidden or less accessible areas such as ductwork and ceiling joists.

Implementing Control Measures

Once risks have been evaluated, it is vital to implement control measures to minimize the likelihood of a dust explosion. These controls can be engineering solutions, such as installing dust collection systems with explosion protection devices and administrative practices like enforcing regular cleaning and maintenance protocols. Training workers on safe handling practices and equipping them with personal protective equipment (PPE) are also crucial components of risk control. In some cases, using antistatic materials or grounding systems can help reduce the potential for static discharge, which is a common ignition source.

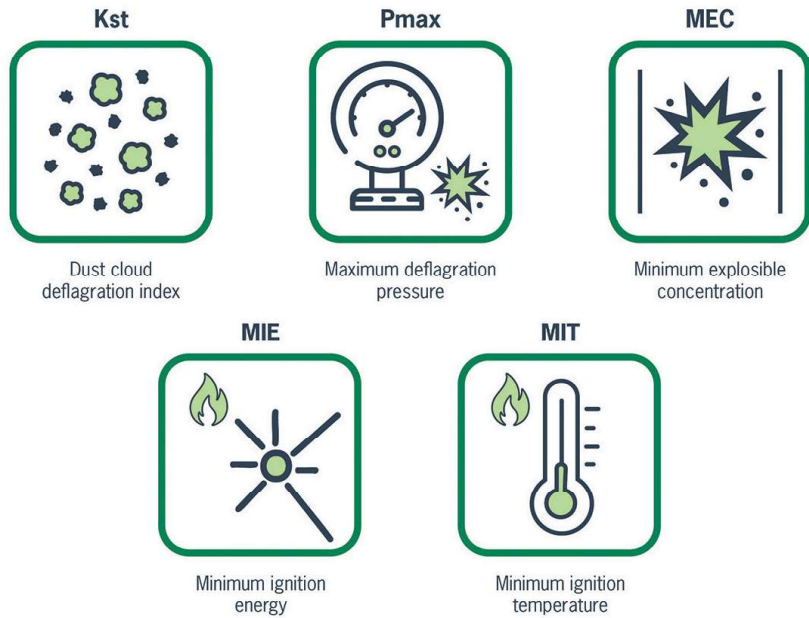
Installing Cartridge-Style Dust Collectors

Cartridge-style dust collectors are widely used in industrial settings due to their flexibility in design, versatility and ease of maintenance. These systems utilize filter cartridges packed with pleated nonwoven fabric, also known as media, which efficiently traps dust and fumes as air moves through them.

When properly designed and maintained, cartridge-style dust collectors can significantly reduce combustible dust accumulation in the work environment. However, it is crucial to understand that these systems, if not adequately protected, can also pose an explosion risk. Dust collectors are enclosed vessels filled with dry particles, and if a fan pulls in a spark or flame from outside the collector, it can result in a dust cloud ignition.

To mitigate this risk, it is essential to equip dust collection systems with explosion protection and other safety measures. Without adequate protection, a dust explosion within a collector can produce a high-pressure wave, potentially fragmenting the housing and projecting flames, heat and dangerous debris into the surrounding area. Therefore, cartridge-style dust collectors should always be part of a comprehensive

Dust Testing Values



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safety plan, including explosion protection equipment and regular maintenance.

Practicing Safe Housekeeping

Maintaining cleanliness through well-structured housekeeping protocols is equally important. Regular cleaning practices should be performed using appropriate methods to minimize dust dispersion. Improper cleaning techniques can worsen dust hazards. Avoid using compressed air or air wands, as they disperse dust into the air. Instead, opt for high-efficiency dust collection systems equipped with explosion protection features to ensure safety and compliance.

Performing Safe Dust Disposal

Safe dust disposal methods should also be clearly outlined in your dust management program. It is essential to dispose of combustible dust in a way that prevents accumulation and potential ignition. This may involve using sealed containers, following specific disposal protocols for different types of dust, and adhering to local regulations regarding hazardous waste.

When required, a well-designed, fully surrogate-tested, bag-in/bag-out (BIBO) and hopper discharge liner system safely contains dust and protects personnel from exposure.

Conducting Regular Equipment Maintenance

Equipment maintenance plays a crucial role in managing combustible dust risks. Dust collectors and other safety equipment must be regularly inspected and maintained to ensure optimal performance. This includes checking for leaks, ensuring proper air filtration and replacing worn or damaged parts. Preventive maintenance prolongs equipment life and prevents the buildup of combustible dust within systems.

Summing It Up

Managing combustible dust hazards is vital to maintaining a safe industrial workplace. By understanding the nature of dust explosions, conducting thorough risk assessments, and following best practices for cleaning and safety, occupational health professionals can significantly reduce the likelihood of dust hazard incidents. Regular training, diligent housekeeping and proactive safety management are essential for fostering a safer environment. **OHS**

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