

COMBUSTIBLE DUST

Myth vs. Fact: Understanding Combustible Dust and Dust Collectors

Clearing the air on common myths about combustible dust hazards and how NFPA standards and explosion protection systems can help facilities stay compliant and safe.

BY BRIAN RICHARDSON

If your facility handles materials or powders that produce dust during processes like handling, transferring, packaging or processing, you may face the risk of a combustible dust explosion. These explosions happen when a dense cloud of combustible dust ignites in a confined space. The initial explosion, known as the primary explosion, typically occurs in an isolated area. However, the resulting pressure can dislodge settled dust in the facility, triggering more widespread and destructive multilevel advancements of explosions.

Combustible Dust Incident Statistics

Recognizing the materials commonly involved in dust explosions and fires is essential for ensuring workplace safety.

DustEx Research Ltd. has recorded 263 fires, 53 explosions, 94 injuries and 62 fatalities around the world related to combustible dust between January 1, 2023, and January 1, 2024.

From the global incident data, food and wood products accounted for 79 percent of the fires and explosions recorded, 76 percent of the injuries and 24 percent of the fatalities. Dust collectors accounted for 13 percent of combustible dust fires and explosions in 2023.

Loss history from dust explosions in the United States from 2016 through 2023 shows an average of 28 dust explosions per year, 25 injuries and a range from one to six yearly fatalities over the last eight years. Dust fires are excluded in this analysis of dust explosions.

Separating Combustible Dust Myths From Facts

Understanding the realities of dust control and explosion risks is essential for maintaining a safe and compliant facility. The following "Myth vs. Fact" section dispels common misconceptions and provides accurate insights for effectively managing hazardous dust.

Myth: Hazardous dust is easy to see and identify.

Fact: Many airborne dust particles in plants and factories are too small to be seen with the naked eye. Industrial dust collectors are designed to capture and contain these minute harmful particles. They achieve this by cycling the dust-laden airstream through filter cartridges, which trap the dust and release clean air back into the environment. These collectors are typically large pieces of equipment, located either inside or outside the facility.

Myth: Explosions in dust collectors are rare and random, so there's no need to worry about them.

Fact: Explosions can occur in any dust collector when a concentrated cloud of combustible dust is suspended in the system. A spark or ember, often from production processes, static electricity or other ignition sources, can ignite the dust cloud, triggering an explosion. Proper maintenance and safeguards can mitigate these risks.

For example, active explosion protection devices aim to prevent

explosions by detecting and responding to potential incidents before or during their occurrence. Passive explosion protection systems activate after an explosion begins, working to control the event, thereby safeguarding employees and minimizing equipment damage.

Myth: Dust collector explosions can always be prevented.

Fact: While it's not always possible to prevent explosions in dust collectors, systems can be implemented to ensure they don't cause harm. Explosion protection systems such as explosion venting, isolation valves and safety monitoring filters are critical for mitigating incidents. These systems, guided by National Fire Protection Association (NFPA) standards, help ensure that any explosion is safely contained within the dust collector rather than in open facilities, protecting personnel and infrastructure.

The new NFPA 660: Standard for Combustible Dusts, effective December 6, 2024, is a comprehensive standard that consolidates most existing NFPA regulations related to combustible dust into a single, unified guideline. By merging six separate NFPA standards, NFPA 660 aims to simplify compliance and provide clear, actionable guidance. It will include both fundamental principles and industry-specific requirements to help facilities manage combustible dust risks and enhance safety against fires and explosions.

Myth: Explosion vents are unnecessary if collectors are built robustly.

Fact: Explosion vents are vital safety features. They are the most commonly used method for protecting industrial dust collectors. When dust inside the collector combusts, the pressure rises rapidly. In such cases, explosion vents open, allowing the pressure and flame front to exit in a safe direction. This protects personnel and minimizes structural damage. The current NFPA 68 – Standard on Explosion Protection by Deflagration Venting outlines specific criteria for the design, location, installation, maintenance and proper use of these venting systems.

Myth: Only certain facilities need to test their dust for combustibility.

Fact: Per NFPA 660, testing is required if you suspect that a dust could be combustible. It is a common practice to assume your process dust is explosive unless testing confirms a 0 Kst (explosibility index) value. If testing indicates combustibility, a dust hazard analysis (DHA) must be conducted to determine its Kst value and maximum pressure rise (Pmax). Dust with a Kst value greater than 0 is considered explosive, and most types of dust fall into this category. The finer the dust particles, the greater the explosion risk.

A DHA is essential and is required per NFPA 660 for identifying potential combustion and explosion hazards and determining the appropriate fire and explosion protection measures. Additionally, your dust collection equipment supplier will need the Kst and Pmax values to properly design and size explosion venting or sup-

COMBUSTIBLE DUST

pression systems, ensuring safety and regulatory compliance.

Myth: Vent and discharge duct sizing is straightforward and doesn't require specialized calculations.

Fact: Explosion venting is a critical safety measure for devices and systems designed to release combustion gases and pressure caused by a deflagration within an enclosure. Proper venting and ducting minimizes structural and mechanical damage. As a result, accurate calculations and expert installation are essential.

The current NFPA 68 – Standard on Explosion Protection by Deflagration Venting outlines detailed methods for calculating the correct size of explosion vents and discharge ducts. The current NFPA 69 – Standard on Explosion Prevention Systems extends beyond explosion venting to address the whole dust collection system. It includes inlet and outlet ducting, spark-extinguishing systems and methods for preventing an explosion from traveling back into the building or to process locations upstream of inlet duct work.

Myth: Dust collectors should always be installed outdoors.

Fact: While outdoor installation of dust collectors is generally safer, it is not always mandatory. The NFPA recommends placing outdoor dust collectors in locations where they can vent to a safe area that doesn't endanger the plant or personnel. Outdoor units must be designed to vent away from buildings and populated areas.

For indoor installations handling combustible dust, it is essential to equip dust collectors with appropriate explosion protection systems to ensure safety.

Flameless venting devices safely vent explosions indoors without allowing flames to escape the collector. However, this solution is not recommended for applications involving toxic dust, as it may release dust into the air during venting. When choosing a flameless venting system, ensure the manufacturer provides third-party-certified testing results for your records.

Explosion isolation valves are another protection option, designed to prevent flames and pressure from traveling through inlet ducting into the process area. Additionally, integrated safety monitoring filters provide protection by isolating downstream equipment from the progression of a flame front during an explosion.

Dust collectors that are installed indoors must have an appropriate explosion protection system.

Final Thought

By distinguishing myths from facts, facilities managers can better understand the importance of proper dust collection, explosion protection and compliance with NFPA standards to maintain a safe work environment. **OHS**

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