

NCDOL INDUSTRY ALERT

Division of Occupational Safety and Health

Combustible Dust Poses a Dangerous, Explosive Threat in the Workplace



In North Carolina, an explosion of fine plastic powder used in the manufacture of polyethylene products killed six people and injured 38. Wood dust in a particleboard manufacturing plant explosion killed three and injured 10 in Pennsylvania. In Mississippi, rubber dust exploded in a rubber manufacturing plant, killing five and injuring 11. And in Kansas, a series of wheat-dust explosions in a large grain storage facility resulted in the deaths of seven people. Accident investigators in each of these facilities, although different industries, found similar conditions that resulted in a massive, tragic dust explosions. They are quite different one from another. In the stories mentioned above, however, they all met the five conditions necessary for a dust explosion: oxygen, fuel, ignition source, dispersion of dust, and confinement. Your facility may have the same hazard!

Dust Is a Hazard

Dusts pose a range of hazards from simple nuisance to explosion hazards. Minor hazards may include reduced visibility and slippery surface conditions. Some dusts such as asbestos and silica pose serious respiratory hazards and long term health effects such as pneumoconiosis. Many different dusts are recognized as a combustion and explosion hazard. The variety of combustible dusts creates difficulty for a brief discussion. Industries with this hazard are classified as a Class II locations. This classification is based on the National Electrical Code article “Class II Locations”, those that are hazardous because of the presence of combustible dust.

North Carolina is home to many industries where the hazard of combustible and explosive dust can be commonly found such as the following:

- Wood processing and storage
- Grain elevators, bins and silos
- Flour and feed mills
- Manufacture or storage of metal powders such as magnesium and aluminum
- Chemical production

- Plastic production
- Starch or candy producers
- Spice, sugar and cocoa production or storage
- Coal handling or processing areas
- Pharmaceutical plants
- Dust collection bins or bags
- Shelves, nooks, crannies, inside of equipment and above false ceilings in all facilities

Hazard Assessment

A thorough hazard assessment is essential in identifying and eliminating factors contributing to an explosion. Dusts are generated in various parts of any production process. Explosions can occur within any process where a combustible dust accumulates, is produced or stored, is airborne, and can be triggered by a variety of energy sources. The severity of the resulting explosions is related to the heat released in the combustion of these materials. Only a couple of these dust types spontaneously ignite in air; the majority of them need another source of ignition. Possible ignition sources include:

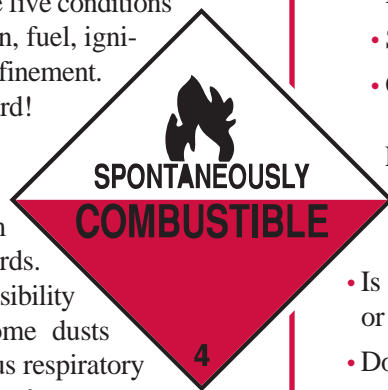
- Open flames (welding, cutting, matches, etc.)
- Hot surfaces (dryers, bearings, heaters, etc.)
- Heat from mechanical impacts
- Electrical discharges (switch and outlet activation)
- Electrostatic discharges
- Smoldering or burning dust
- Cigars, pipes and cigarettes

Look for this hazard in your facility and try to eliminate it. Ask yourself questions such as the following when considering your facility or process.

- Is vacuuming used whenever possible rather than blowing or sweeping combustible dust?
- Do you have electrical installations in hazardous dust or vapor areas? If so, do they meet the National Electrical Code (NEC) Chapter 5 for hazardous locations?
- Are accumulations of combustible dust routinely removed from elevated surfaces including the overhead structure of buildings, false ceiling, shelves, etc.?
- Is metallic or conductive dust prevented from entering or accumulating on or around electrical enclosures or equipment?
- Where may dust accumulate that we have not considered in this production process?
- Wood dusts can decay and create their own heat as a possible source of ignition. Has this possibility been addressed?

Prevention

Investigators at the accidents mentioned determined that the explosions, like most accidents, resulted from a chain of events or factors. Training employees to recognize this hazard





as an unsafe condition and do something about it can break a link in the chain of events that could lead to an explosion, thereby preventing it.

In simple terms, a dust explosion is a very rapid combustion or burning. Reducing any one of the five factors necessary to sustain the explosion can prevent it. The primary method for prevention is reducing or eliminating the fuel load with good housekeeping. Good housekeeping in this context is essential for explosion prevention. Dust removal can be accomplished by good ventilation, extraction and removal systems, dust collection systems, and manual housekeeping where automated collection systems cannot reach. In dusty environments, vacuums and other electrical equipment will need to be spark and explosion proof. Compressed air blowers should never be used for the removal of dust. Minor but steady leaks in any production system must be addressed, as these can cause large amounts of dust to accumulate over a period of time, especially if the process runs at a slightly elevated pressure. Small amounts of dust can create large clouds. Dust will always be present in some processes. The best way to avoid dust accumulation is to be constantly aware of the surroundings. Respect for the hazard and a good housekeeping program are essential in eliminating the explosion hazard. Thorough employee training is also crucial. Training should include information on the hazards of dust. It is also vital to address the specific characteristics of the dust with which the employees work.

Applicable Regulations

The National Fire Protection Association Codes address the combustible dust hazard in many chapters each based on the particular flammability characteristics of a given dust. NFPA Articles 650–664 discuss controlling and preventing dust explosions in various industries.

Available Resources

The OSH Division’s Consultative Services Bureau provides free services to employers around the state. See the Web site <http://www.nclabor.com/osha/consult/bcs1.htm> for information on the program and to download a request form.

Disclaimer

This Industry Alert provides general information about the types of combustible dusts and their characteristics. Information about a specific substance should be considered before any decisions are made in a specific situation.

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