Combustible Dust

What is it?

Though dust is a constant, very few people tend to think about dust as a potential hazard. In fact, fine dust can have a paralyzing effect on your business. Dust could even ruin your business.

In general any combustible material in a finely divided form can burn rapidly. The right amount of dust suspended in the air in an enclosed space and exposed to a source of ignition can explode. That explosion can blow out the building or structure and/or start a fire in other combustible or flammable materials in the area which can then spread rapidly.

The shock waves produced by these types of explosions can cause death, injury and destruction of entire buildings. The US Department of Labor investigated an explosion caused by titanium dust in 2010 in West Virginia that killed three and another in 2008 where 14 employees were killed in a sugar dust explosion in Georgia. From 1980 to 2005, 281 combustible dust incidents were identified by the U.S. Chemical Safety and Hazard Investigation Board (CSB), about 11 incidents per year. Could you be next?

Materials Having Dust Explosion Potential

Some materials that can be explosive when in the form of a dust include:

- Foods: sugar, spices, starch, flour and feed
- Organics: grains, seeds, tobacco, wood, rubber, coal, etc.
- Manufactured products: plastics, paper, pulp, rubber tires, furniture, textiles, pharmaceuticals, pesticides, dyes. etc.
- Metals: aluminum, titanium, iron, zinc, magnesium, etc.

The above are only some of the materials that when in dust form present a greater hazard to property and life.

What can lead to fires and explosions?

Many factors contribute to dust fires and explosions, but those cited more often by OSHA include poor housekeeping, poor ventilation design, a lack of thorough maintenance procedures, and dust collection systems that are not adequate for their current use.

Dust fires are the product of four elements; fuel, oxygen, heat and a resulting chemical reaction. Specifically they are dust, which if left suspended in air becomes the fuel, oxygen present in the building, a heat source such as smoking, friction caused by operations, a heater, etc. When these three elements combine to heat the dust to the ignition temperature, a chemical reaction occurs. The result is the fire. Without all four elements, a fire cannot occur. By removing any one of the elements and the fire can be extinguished.

A dust explosion becomes possible when the dust is allowed to accumulate in the right quantity and/or concentration in a confined space and the remaining three elements of a fire are introduced.

Controls to prevent a fire or explosion

The easiest way to prevent a fire or explosion is to remove one or more of the elements needed to generate them.

To start, performing a facility analysis can be useful in quickly identifying the hazards and the potential for a dust explosion. Specifically, look at processes that use, consume or produce combustible dusts; like grinding and cutting. Identify open areas where dust may remain suspended in the air, build up or hidden areas where dust may accumulate; horizontal surfaces such as rafters, on top of sprinkler pipes or mezzanines and ductwork are just a few examples. Second, identify any ignition sources. These could be smoking, welding, poor electrical, overheating of equipment or equipment parts, or heat caused by friction within a machine or the process used to generate the dust.

Once the analysis has been performed, measures can be taken to prevent and minimize the hazard to the operations and property. These include using the right electrical equipment and wiring methods, controlling static electricity by bonding and grounding equipment, prohibiting smoking in or near areas that produce or use combustible dust and installing appropriate and adequate dust collection systems for the operations.

Other methods of control include separation or segregation of the hazard by using distance or a physical barrier. Venting can help remove the dust from the air as well lowering the amount that can accumulate in a dust cloud. Sprinkler systems and specialized spark detection/explosion suppression systems can often be used for containment of an explosion or fire at the ignition point.

Training employees

All employees should have training about the hazards of combustible dusts present in the work place. This should include identifying no smoking areas, housekeeping expectations and description and identification of potential contributing factors to a fire or explosion. Having a trained staff responsible for the preventative maintenance of the equipment and machinery generating combustible dust or located near it is essential to the proactive identification of potential ignition sources

Conclusion and sources

By taking a hands-on approach to prevent the buildup of dust in buildings and structures, eliminating ignition sources and avoiding the “it won’t happen to me” mentality, the chance of a dust explosions can reduced. Remaining vigilant in the protection of life and property from the hazard of combustible dust will help improve the survival of your business.

For more information on best engineering controlling measures please see the National Fire Protection Association’s Combustible Dust Standard.

For more general information see:

U.S. Department of Labor: https://www.osha.gov/dsg/combustibledust/index.html

For a quick reference OSHA has provided a printable poster of what they consider to be combustible dusts: https://www.osha.gov/Publications/combustibledustposter.pdf

U.S. Chemical Safety Board: http://www.csb.gov/

While OSHA provides a standard for controlling dust and preventing fires and explosions, the U.S. Chemical Safety Board (CSB) has determined there approach and standards to be “unacceptable” and is calling for a change. More on the CSB’s response to OSHA’s response to combustible dust can be found here.

http://www.csb.gov/us-chemical-safety-board-determines-osha-response-to-seven-open-csb-recommendations-on-dust-fuel-gas-and-process-safety-management-to-be-unacceptable/