

Dust **busters**

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Dust explosions aren't confined to obvious industries like coal mining, wood processing and grain storage. Food, pharmaceutical, plastics and other manufacturers can also be at risk.

Most organic and plastic materials with fine dust particles combust rapidly and can present an explosion hazard when dispersed in air. The increase in diversity of manufactured products means many more industries are now at risk from dust explosion hazards. These include industries handling foodstuffs (eg grains, starch, flour, rice, sugar and cereals), paper, wood, fertilisers, pharmaceutical powders, coal, toner, metal powders and plastic powders.

Dust explosions can be devastating, like the one that occurred at Best Care Foods in Gunnedah in early 2003, where factory losses topped \$10 million and 30 surrounding homes and six factories were damaged. A few days later in the US, the West Pharmaceutical Services rubber manufacturing plant dust explosion killed six employees and injured 38 people.

As is to be expected, explosions usually occur at sites where people lack awareness of the hazard and don't take steps to minimise the risks.

Foundations for an explosion

Dust explosions occur when fine solid particles in the air catch fire. The dispersion of combustible particles to form a dust cloud allows rapid combustion to take place because of increased oxygen concentration around the particles.

Factors that will determine whether certain dusts are less or more likely to cause an explosion include their shape (flatter particles have more exposure to oxygen), size, concentration in the air and moisture content. Likewise, certain processes are more prone to creating dust clouds.

To catch fire, the dust cloud must come into contact with an ignition source of sufficient energy to initiate flame propagation. The minimum energy required to ignite a particle depends on the characteristics of that dust material. Finer dust is easier to ignite and also burns faster. Static electrical charges, like the ones that occur when our bodies come in contact with a metal object, can create a spark that's strong enough to light a dust cloud with a low minimum ignition energy (eg aluminium, sugar or PMMA plastic).

Ignition sources can range from a naked flame to a hot surface, mechanically generated sparks (eg metal parts rubbing), electrically-generated sparks or electrostatic discharge (eg dust collector bags with material drawn across the surface).

The minimum energy required to ignite a dust cloud increases if moisture is present in the air. Moisture content can also cause agglomeration, which further reduces the explosiveness of most dusts by effectively decreasing the exposed surface area.

Is your business at risk?

A thorough onsite risk assessment should be carried out at premises where significant dust is known to be present. Site areas that have exposure to dust explosion hazards can be classified in zones, depending on whether the explosive mixture of combustible dust and air occurs continuously, occasionally or rarely in those locations.

Not surprisingly, processes that create dust clouds are conducive to explosions. These include pneumatic conveying, dropping fine material by gravity from hoppers and transferring material by bucket elevators for overhead feeding into silos. In turn, processes that create elevated ambient temperatures, exposure to heat sources or elevated pressures also increase the likelihood of a dust explosion.

Certain process equipment that is prone to dust explosions includes dust collectors, dryers/ovens, pulverisers/mills, pneumatic conveyors/elevators, silos/bins, sanders, electrostatic precipitators and grinders.

Hazard reduction strategies

If your business is at high risk of a dust explosion, steps can be taken to minimise the dangers. These include:

- maintaining good housekeeping to reduce dust accumulation and potential cloud formation
- preventing ignition sources by installing static earthing, explosion proof electrical equipment and metal detectors/separators to prevent sparking, and checking electrical connections to prevent arcing
- avoiding naked flames or heat sources
- using technologies that minimise dust or dust cloud creation, eg dust suppression hopper or Olds Elevator
- installing explosion suppression equipment to minimise the impact in the event of an explosion (eg explosion venting systems, automatic water/foam/deluge sprinklers, inert gas extinguishers etc).