

Controlling the hazards of combustible dusts in manufacturing

Any industry that produces dust as a result of its manufacturing processes may be at risk of combustible dust fires or explosions. This may include the following industries:

- Food and beverage products manufacturing (e.g., bakeries)
- Wood and paper products manufacturing (e.g., sawmills, wood pellet plants, cardboard and paper facilities)
- Plastic, rubber, or chemical products manufacturing (e.g., pharmaceutical plants)
- Coal mining and processing
- Metal products manufacturing
- Agriculture (e.g., fertilizer plants, composting facilities)
- Fabric products manufacturing

For more details, refer to the U.S. Occupational Safety and Health Administration’s [combustible dust poster](#). The poster includes an extensive list of products and materials that may present a risk of a combustible dust explosion.

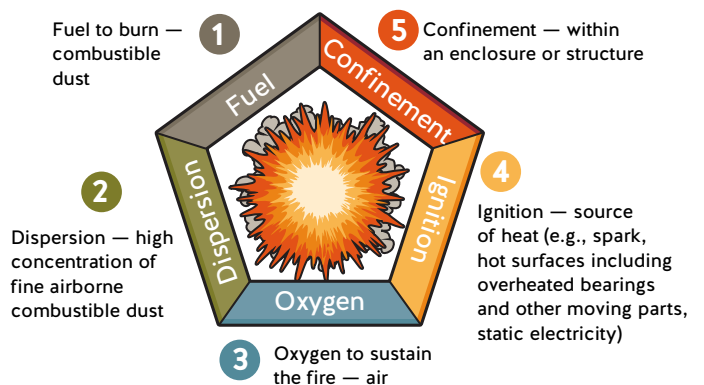
What is combustible dust?

Most dust is combustible, which means it can easily catch fire and burn. If fine dust particles catch fire when suspended in air, the fire can spread rapidly. Under some conditions, this may result in an explosion.

What is a combustible dust explosion?

A combustible dust explosion is the very rapid burning of dust suspended in air. Heat and pressure build up very quickly. An explosion can occur when the five basic conditions of the “dust explosion pentagon” are present.

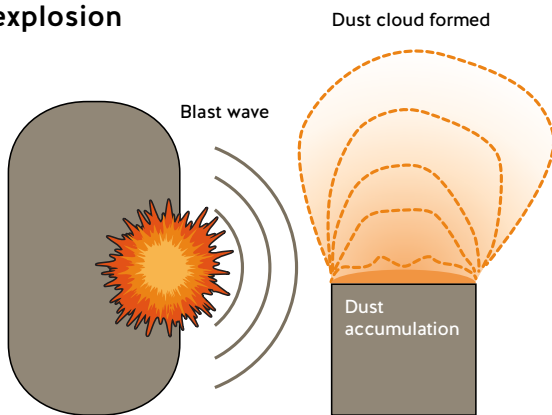
Dust explosion pentagon



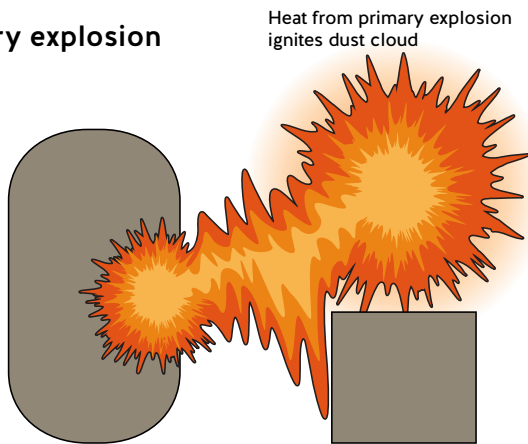
Primary and secondary explosions

The first or primary explosion disturbs built-up combustible dust on surrounding surfaces. Then this dust ignites in a secondary explosion. Secondary explosions are often more powerful than primary explosions because of the increased amount and concentration of combustible dust.

Primary explosion



Secondary explosion



Reproduced from the OSHA Fact Sheet, *Hazard Alert: Combustible Dust Explosions*, U.S. Department of Labor.

How do you know what level of risk your facility faces?

Complete a risk assessment. A risk assessment is a process that evaluates the probability and degree of possible illness, injury, or death in a hazardous situation. For combustible dusts, the purpose of a risk assessment is to determine which dust sources and areas of accumulation should be given priority for dust control. A risk assessment should be documented, and it should be reviewed any time there are changes that could affect dust accumulations.

What factors should a risk assessment consider?

Consider the following when identifying the risk of a combustible dust explosion in the workplace:

- What are the materials and processes used in the manufacturing methods? Do these materials and processes produce combustible dusts?
- Does the facility have areas (visible or hidden) where combustible dusts can accumulate? Is there a process in place to safely remove these accumulations?
- Do any of your processes disperse dust into the air or create dust clouds?
- Are there potential ignition sources (for example, hot work, hot surfaces, friction points, electrical equipment, and/or static electricity)?

How do you control the hazards of combustible dust?

Create a combustible dust control program that includes the following:

- A complete list of potential sources of combustible dust and locations where it might accumulate.
- A dust threshold limit. The U.S. National Fire Protection Association (NFPA) warns that depending on the nature of the dust, a significant explosion hazard can exist when there is as little as 0.8 mm (1/32 in.) of dust over five percent of a room's surface area.
- A dust cleanup program, which should describe methods of dust removal. Housekeeping processes should include:
 - Maintaining equipment that could act as an ignition source
 - Cleaning of all elevated surfaces, including equipment, beams, and pipes
 - Removing accumulations of dust from accessible surfaces after every shift

- Specific safe work procedures for activities such as hot work and the de-energization of equipment during cleanup activities.

If a cleanup program doesn't sufficiently control dust accumulations, you'll need to put in place a dust collection system. A system may consist of collection hoods, conveyance ducting, a dust collector, and an exhaust fan or blower.

To learn more about these systems, refer to the WorkSafeBC publication [Dust collection systems in manufacturing facilities](#).

For more information

For more information on controlling the hazards of combustible dust, visit worksafebc.com and search "combustible dust".

Combustible Dust

Does your company or firm process any of these products or materials in powdered form?

If your company or firm processes any of these products or materials, there is potential for a "Combustible Dust" explosion.

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| <p>Agricultural Products</p> <p>Egg white Milk, powdered Milk, nonfat, dry Soy flour Starch, corn Starch, rice Starch, wheat Sugar Sugar, milk Sugar, beet Tapioca Whey Wood flour</p> <p>Agricultural Dusts</p> <p>Alfalfa Apple Beet root Carrageen Carrot Cocoa bean dust Cocoa powder Coconut shell dust Coffee dust Corn meal Cornstarch Cotton</p> | <p>Cottonseed Garlic powder Gluten Grass dust Green coffee Hops (malting) Lemon peel dust Lemon pulp Linseed Locust bean gum Malt Oat flour Oat grain dust Olive pellets Onion powder Parsley (dehydrated) Peach Peanut meal and skins Peat Potato Potato flour Potato starch Raw yucca seed dust Rice dust Rice flour Rice starch Rye flour Semolina</p> | <p>Soybean dust Spice dust Spice powder Sugar (10x) Sunflower Sunflower seed dust Tea Tobacco blend Tomato Walnut dust Wheat flour Wheat grain dust Wheat starch Xanthan gum</p> <p>Carbonaceous Dusts</p> <p>Charcoal, activated Charcoal, wood Coal, bituminous Coke, petroleum Lampblack Lignite Peat, 22%H_2O Soot, pine Cellulose Cellulose pulp Cork Corn</p> | <p>Chemical Dusts</p> <p>Adipic acid Anthraquinone Ascorbic acid Calcium acetate Calcium stearate Carboxy-methylcellulose Dextrin Lactose Lead stearate Methyl-cellulose Paraformaldehyde Sodium ascorbate Sodium stearate Sulfur</p> <p>Metal Dusts</p> <p>Aluminum Bronze Iron carbonyl Magnesium Zinc</p> <p>Plastic Dusts</p> <p>(poly) Acrylamide (poly) Acrylonitrile (poly) Ethylene (low-pressure process)</p> | <p>Epoxy resin Melamine resin Melamine, molded (phenol-cellulose) Melamine, molded (wood flour and mineral filled phenol-formaldehyde) (poly) Methyl acrylate (poly) Methyl acrylate, emulsion polymer Phenolic resin (poly) Propylene Terpene-phenol resin Urea-formaldehyde/cellulose, molded (poly) Vinyl acetate/ethylene copolymer (poly) Vinyl alcohol (poly) Vinyl butyral (poly) Vinyl chloride/ethylene/vinyl acetylene suspension copolymer (poly) Vinyl chloride/vinyl acetylene emulsion copolymer</p> |
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Dust Control Measures

The dust-containing systems (ducts and dust collectors) are designed in a manner (i.e., no leaking) that fugitive dusts are not allowed to accumulate in the work area.

The facility has a housekeeping program with regular cleaning frequencies established for floors and horizontal surfaces, such as ducts, pipes, hoods, ledges, and beams, to minimize dust accumulations within operating areas of the facility.

The working surfaces are designed in a manner to minimize dust accumulation and facilitate cleaning.

Ignition Control Measures

Electrically-powered cleaning devices such as vacuum cleaners, and electrical equipment are approved for the hazard classification for Class II locations.

The facility has an ignition control program, such as grounding and bonding and other methods, for dissipating any electrostatic charge that could be generated while transporting the dust through the ductwork.

The facility has a Hot Work permit program.

Areas where smoking is prohibited are posted with "No Smoking" signs.

Duct systems, dust collectors, and dust-producing machinery are bonded and grounded to minimize accumulation of static electrical charge.

The facility selects and uses industrial trucks that are approved for the combustible dust locations.

Prevention Measures

The facility has separator devices to remove foreign materials capable of igniting combustible dusts.

MSDSs for the chemicals which could become combustible dust under normal operations are available to employees.

Employees are trained on the explosion hazards of combustible dusts.

Protection Measures

The facility has an emergency action plan.

Dust collectors are not located inside of buildings. (Some exceptions)

Rooms, buildings, or other enclosures (dust collectors) have explosion relief venting distributed over the exterior wall of buildings and enclosures.

Explosion venting is directed to a safe location away from employees.

The facility has isolation devices to prevent deflagration propagation between pieces of equipment connected by ductwork.

The dust collector systems have spark detection and explosion/deflagration suppression systems.

Emergency exit routes are maintained properly.

