

# Control of Dust in Woodworking Occupancies

## Fact Sheet

The following information provides a summary of Woodworking occupancies and some of the associated hazards and safeguards. It also summarizes many of the requirements of the standards pertaining to this subject.

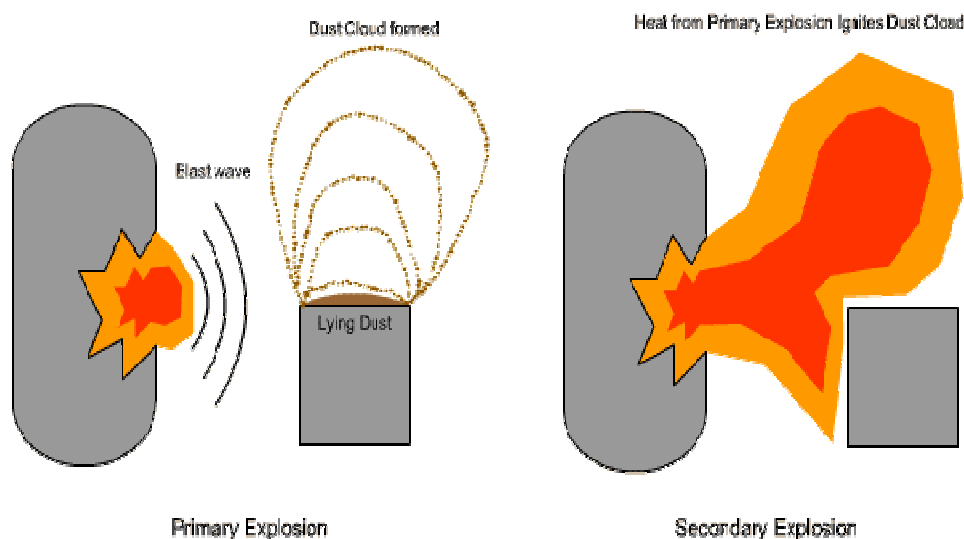
### **Hazards Associated With Wood Dust:**

Many combustible and even non combustible materials become potentially explosive when ground into dust and suspended in a certain concentration in air. Dust explosions have occurred in various occupancies that are handling materials including, but not limited to, grains, starch, flour, feeds, paper, aluminum and plastic dusts. Details in this report are intended to deal with occupancies utilizing only one of these materials..... wood dust.

Every machine that produces wood dust, particles or shavings must be provided with a blower and exhaust system in order to control or eliminate the possibility of an explosion. Dust collection systems fulfill this requirement. They are basically fixed vacuum systems that do exactly what their name indicates.... collect dust wherever it is produced. Control and collection of dust particles, wood chips and wood shavings is accomplished by way of suction through a single or a series of ducts. Dust collection systems are intended to prevent the accumulation of dust on surfaces (layered) and keep suspended dust (airborne) at a safe concentration inside a building. These systems are also used to remove dust from the air to provide cleaner air for breathing.

Dust collection systems should normally be located outside buildings but are permitted to be located inside depending on the woodworking operation, local bylaws and manufacturers' specifications. These systems come in all shapes and sizes which will be described later in this paper.

Dust explosions can be either localized within a small area or cause total destruction of a facility depending on the intensity of the explosion and the building/area or container construction. Dust explosions are similar in some aspects to vapour or gas explosions in that the fuel must be mixed with air and requires an ignition source. The intensity of dust explosions depends on various factors such as, but not limited to, dust type, particle size, dust concentration, oxygen concentration and type of ignition source. While dust must be airborne in order to cause an explosion, layered dust is potentially more dangerous. As shown below, a primary explosion caused in a facility by a relatively small amount of airborne dust will create a blast wave. That wave will blow any layered dust into suspension in the air, producing a tremendous amount of airborne dust that becomes ignited by the heat from the primary explosion causing a much larger, more damaging secondary explosion.



Other concerns which must also be considered when dealing with dusts are housekeeping, associated processes and ignition sources.

## Safeguards Necessary to Control the Hazards:

Occupancies where wood dust is produced are subject to various codes and standards including:

- NFPA #91 - Exhaust Systems for Air Conveying of Materials
- NFPA #664 - Prevention of Fires and Explosions in Woodworking Facilities.
- Local or regional Fire Codes.

As mentioned above, a dust explosion requires three basic elements....

1. an ignition source;
2. oxygen (air); and
3. fuel, in this case, wood dust.

Removing or controlling any one of these will greatly reduce the possibility of an explosion.



Typical Dust Explosion

### Removing or Controlling an Ignition Source

There are several different types of ignition sources which should be given attention. Each has its own characteristics and must be dealt with appropriately. These could include sparks from electrical equipment (may require Class 2, Group G, Division 1 or 2 hazardous locations electrical equipment be installed), static electricity, smoking, open flame, welding operations, hot work processes, etc. The Fire Code defines hot work as: "*any operation involving open flames or producing heat or sparks including, but not limited to, cutting, welding, soldering, brazing, grinding, adhesive bonding, thermal spraying and thawing pipes*". All of these processes must be controlled or eliminated from dusty areas.

### Removing or Controlling the Oxygen

While it is possible in some situations to control or remove oxygen, it is generally not practical. Inducing an atmosphere of nitrogen or carbon dioxide can be used to prevent dust explosions inside enclosed equipment such as rubber grinding drums or processing mills (used in feed and flour operations), but lowering the oxygen concentration in woodworking operations is not a practical method of preventing dust explosions from occurring.

### Removing or Controlling the Fuel (Wood Dust)

Preventing Dust Explosions by removing or controlling the fuel is the easiest way to control the possibility of a dust explosion. There are basically three ways to accomplish this:

1. Isolate dusty operations within a building or in situate them in a separate building. This will ensure that the dust hazard is separated from other operations within the building making it easier to control the dust and ignition sources.
2. Provide good housekeeping. This will reduce layered dust which in effect will reduce the available fuel supply. Without a fuel supply, a dust explosion cannot happen. All aspects of housekeeping in a woodworking operation are extremely important. Any excess fuel such as pieces of wood, sawdust or wood chips should be regularly cleaned up and placed in a non combustible receptacle.
3. Dust Collection-a properly sized and installed dust collection system connected to all necessary machinery will reduce the possibility of an explosion.

### **Dust Collectors in Woodworking Operations:**

As stated before every machine that produces wood dust, particles or shavings must be connected to a blower and exhaust system. Also incorporated in these systems are other features such as:

- Explosion Venting, which basically provides a path for the pressure created by a dust explosion to be safely vented to the exterior of the building,
- Explosion Suppression System, which is a very fast acting extinguishing system installed within the dust collection system and ductwork to extinguish an explosion should one occur,
- Magnetic Metal Separators, which remove ferrous based metals to prevent sparking inside the dust collection system, and
- Electrical Interlocks, which prevent operation of any machinery if the dust collection system is not running.

## Types of Dust Collection Systems:

There are various types of dust collection systems providing effective control of dust in occupancies ranging from the small hobby woodworker to very large industrial woodworkers.

These systems include, but are not limited to:

- small shop vac type vacuums connected to a single machine,
- portable bag type collectors which can be on wheels and easily moved to the required machines,
- larger in place bag type collectors which may have numerous machines ducted and
- large commercial/industrial cyclone systems which will have numerous machines connected to the cyclone through a system of metal ductwork.

All types of dust collectors are considered acceptable as long as they have been researched, selected for the size of occupancy, designed for that use and installed in conformance with all applicable codes and standards for dust collection and also are approved by the Authority Having Jurisdiction.



**Portable Bag Type Collector**

**Compact Bag Filter System**





**Multiple Bag Type Collector**

**Outdoor Cyclone System**





**Metal Ductwork for Dust Collection System**



**Examples of Poor Housekeeping**