

Protect the Environment...  
Save the World  
Dust Explosion



**PV Vacuum Engineering Pte Ltd**  
(A member of Darco Water Technologies Limited)



## Dust Control a Key to avoid Dust Explosion

The first documented dust explosion occurred in Turin, Italy, bakery in 1785. The explosion was caused by the ignition of flour dust by a lamp in a bakery storeroom.

The Most Recent unfortunate event that received international coverage is the China Car Parts factory in the city of Kunshan, in Jianhsu province.

Preliminary investigation as reported by Xinhua said the blast was a dust explosion.

The explosion occurred at 7.37 am at a workshop in the factory, which polishes wheel hubs. Rescuers recovered 44 bodies, while 25 others died at a hospital. At least 187 people were injured.

Such dust explosions have been blamed for other deadly fires. In 2012, a dust explosion in an aluminium lock polishing workshop in Wenzhou killed 13 people and injured another 15. In 2009, aluminium powder exploded in a temporary housing in Danyang, killing 11 people and injuring another 20.

Dust Explosion is a Rare Event, but Catastrophic when it happens!

From 1996 till date, there is at least 106 explosions costing more than US\$ 162.8 million in damages to facilities in the USA.



China Car Parts factory in the city of Kunshan, in Jianhsu province.  
Picture Extracted from Newspaper Report

## Dust Control

**Dust Control is listed in OSHA-USA training for Combustible Dust Control as One of the key for Explosion Safeguards beside Fire Prevention & Protection and Housekeeping.**

PV Contamination Control Vacuum System is a Low Volume high velocity contamination control system. It is the unique application of contaminants (such as dust) control which uses small volume of air at relatively high velocities to control dust from portable hand tools and machining operations.

Control is achieved by capturing the contaminants (such as dust) directly at the point of dust generation using close-fitting, custom-made hoods.

This method avoid dust escaping & polluting the near proximity of where it was generated before it is capture together with the surrounding air into a Conventional Dust Extraction/ Exhaust System.

It totally avoided the generation of any dust cloud within the close proximity of the user, giving very effective dust control.

### Examples of Dust Explosions Cases in USA;

#### Organic Dust Fires & Explosions

Massachusetts (3 Killed, 9 injured) which is caused by explosion in ducts containing heavy deposits of Phenol formaldehyde resin dust.



Organic Dust Fires & Explosions-Massachusetts.

North Carolina (6 Killed, 38 Injured), combustible polyethylene dust accumulated above suspended ceilings at pharmaceutical plant. The plant and nearby buildings were severely damaged.



Organic Dust Explosion:-North Carolina (6 Killed, 38 Injured)

## Experience in The Grain Handling Industry

In the late 1970s, grain dust explosion left 59 people dead & 49 injured. In 1987, OSHA promulgated the Grain Handling Facilities Standard (29 CFR 1910.272).



Imperial Sugar Company, Port Wentworth GA:- Explosion & Fire on Feb 7, 2008, leaving 13 dead and numerous serious injuries.



Imperial Sugar Company, Port Wentworth GA

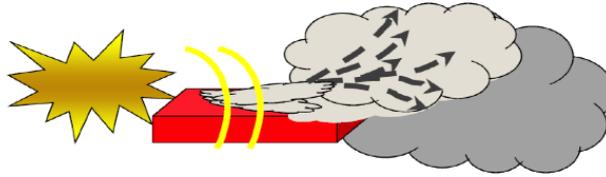
## How does Dust Explosion in a Work Area Happen?

### Dust explosion in a work area



Dust settles on flat surfaces

Some event disturbs the settled dust into a cloud



Adapted from CSB



Dust cloud is ignited and explodes

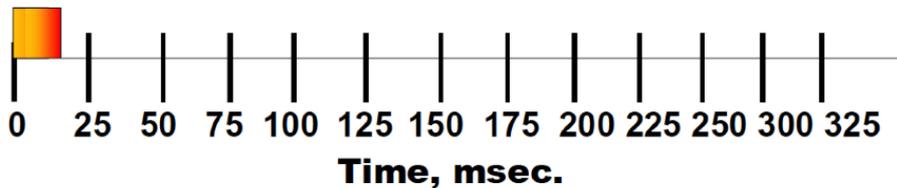
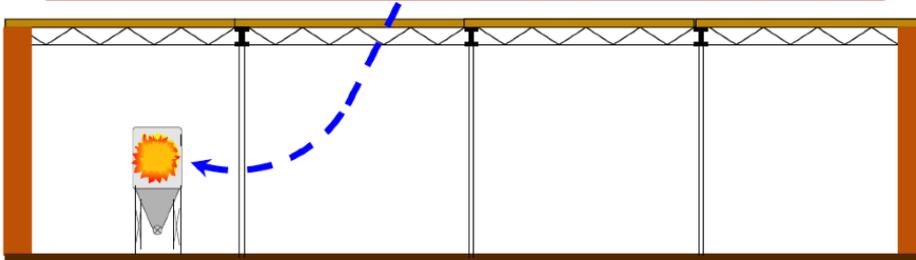


# A Timeline For Dust Explosion & The Results of that Explosion –

Prepared by Joseph P.Howicz CSP, CFPS-Accident Prevention Corporation

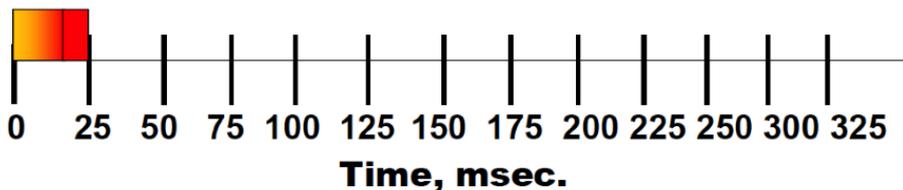
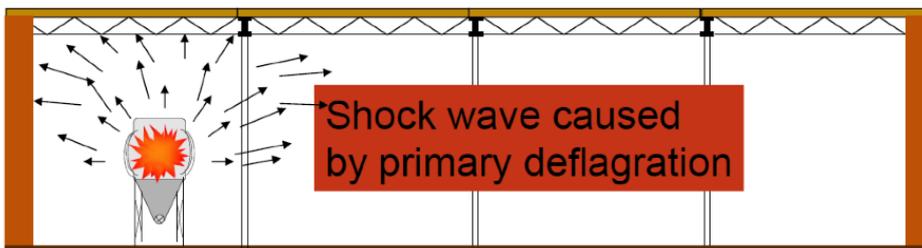
## A Dust Explosion Event

Primary deflagration inside process equipment



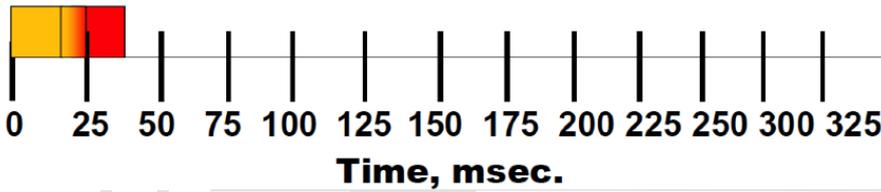
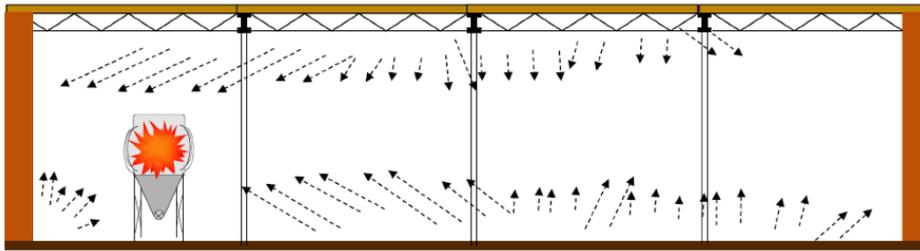
(Timing of actual events may vary)

## A Dust Explosion Event



# A Dust Explosion Event

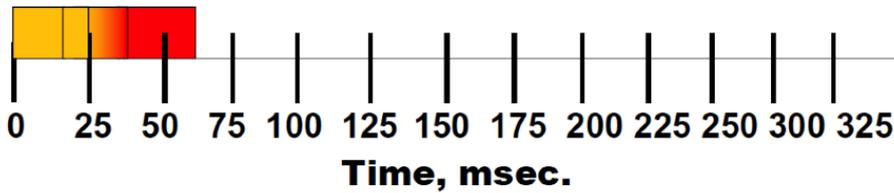
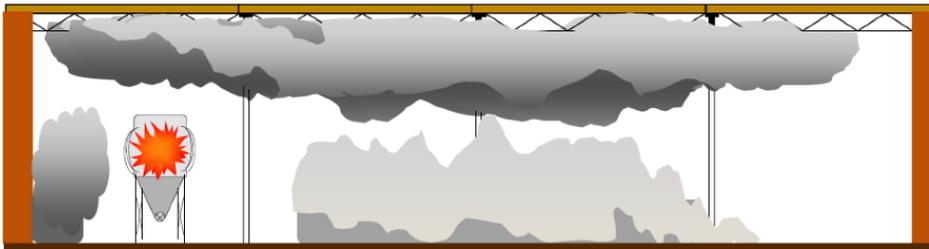
Shock waves reflected by surfaces within the building cause accumulated dust to go into suspension



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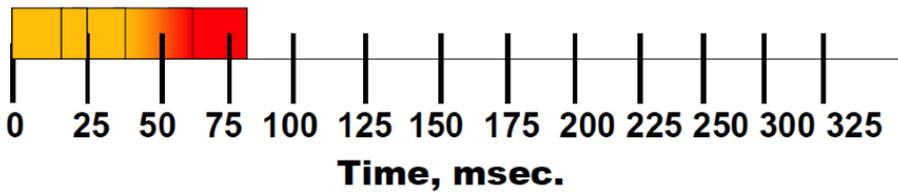
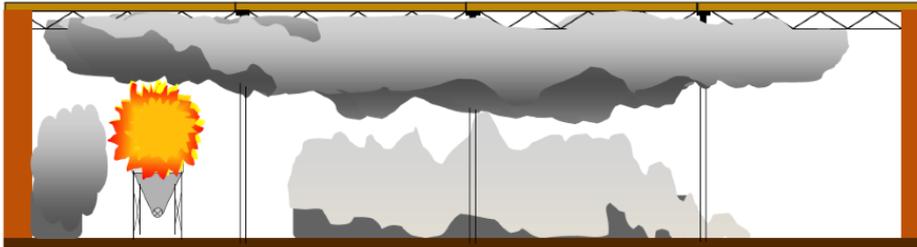
# A Dust Explosion Event

Dust clouds thrown in the air by the shock waves



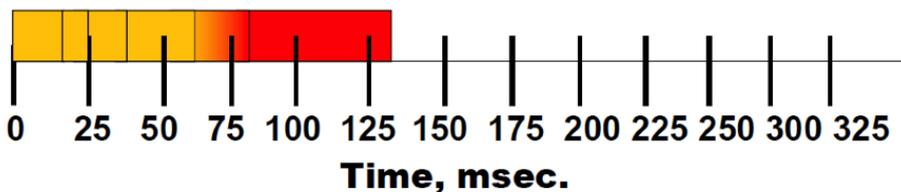
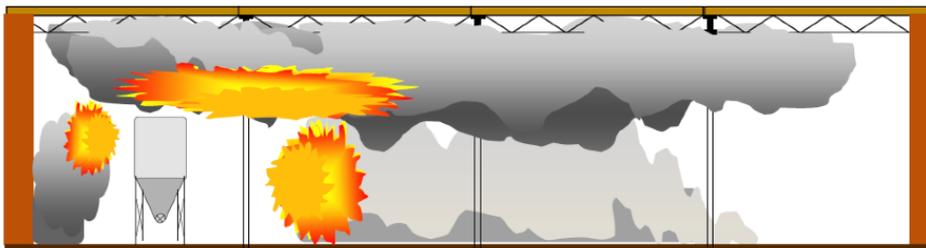
# A Dust Explosion Event

Primary deflagration breaks out of the equipment enclosure - creating a source of ignition



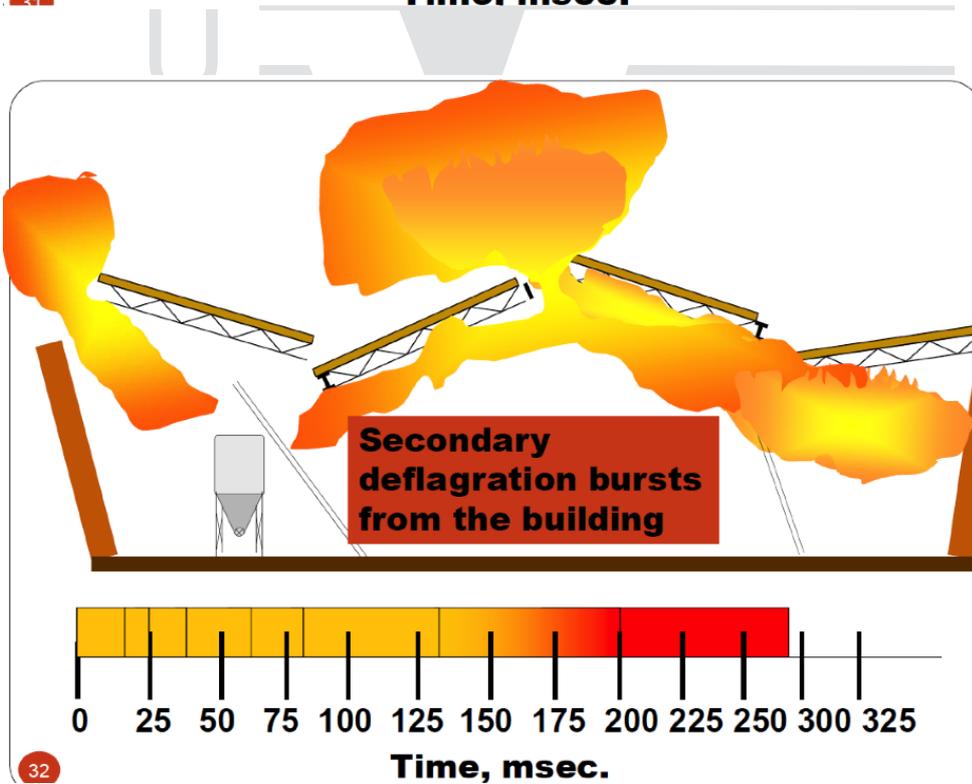
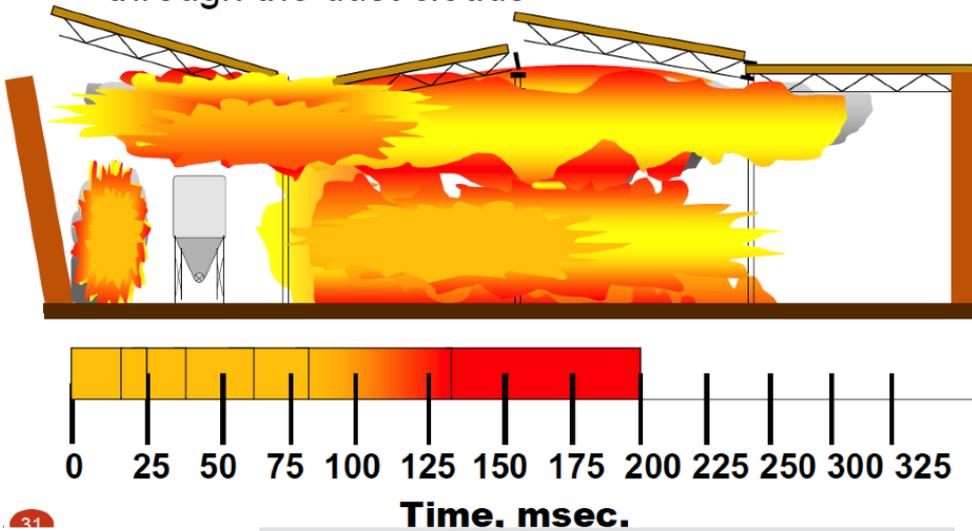
# A Dust Explosion Event

Secondary deflagration ignited



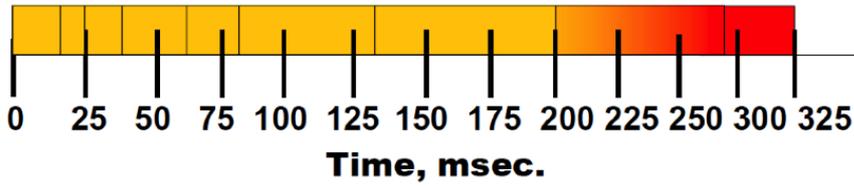
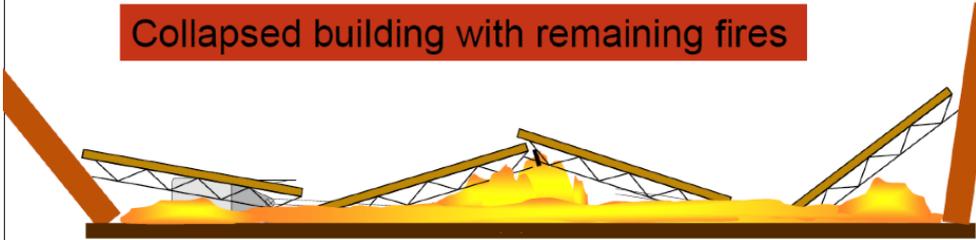
# A Dust Explosion Event

Secondary Deflagration is propagated through the dust clouds

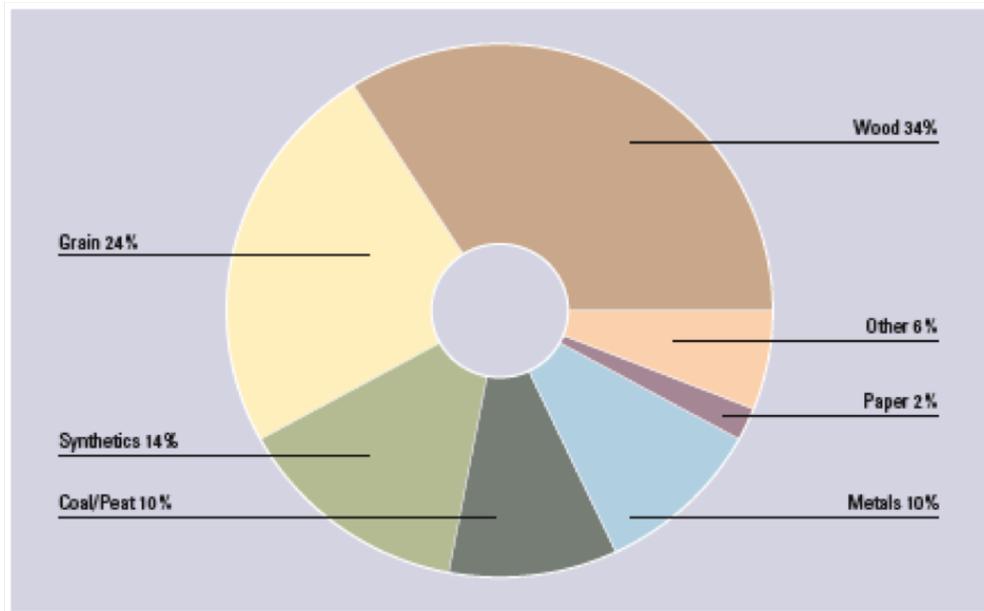


# A Dust Explosion Event

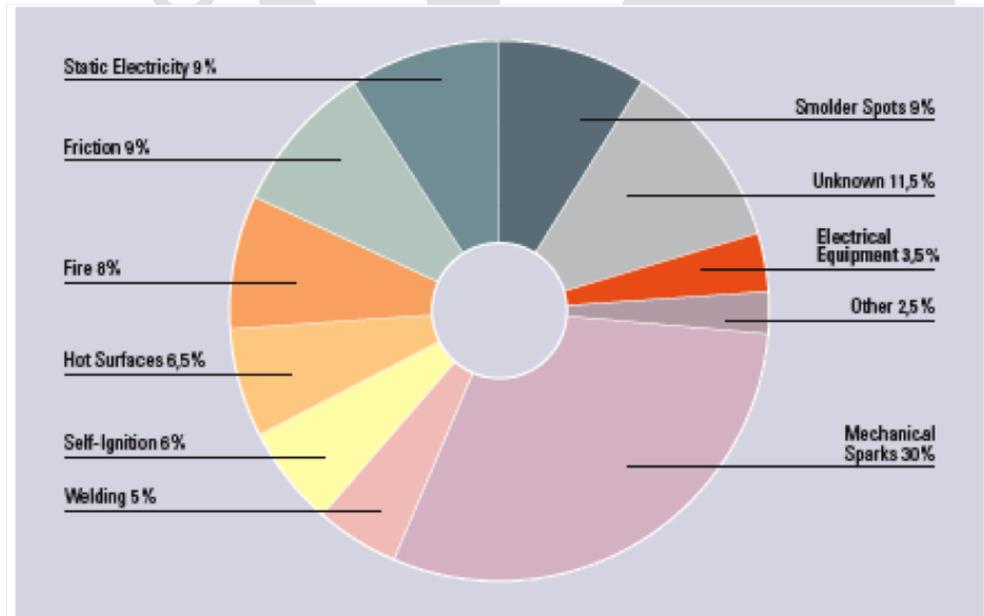
Collapsed building with remaining fires



## Types of Dusts Involved In Explosions



## Types of Ignition Sources



## Examples of materials that have historically caused dust explosions include:

- Cosmetics
- Coal
- Dyes
- Grain and other Dry foods
- Metal
- Pharmaceuticals
- Plastic and rubber
- Printer toner
- Soaps
- Textiles
- Wood & Paper

## Type of Facilities that generate dust

Reducing dust accumulations is a major concern for facilities that produces dust. To effectively capture these dust to prevent it from accumulating near the proximity of where it was generated is the first step towards Dust Control.

Dust Control is a Key to avoid Dust Explosion!

The below is a quick list of some industries with dust...

- Corn Milling, Wet: Establishments primarily engaged in milling corn or sorghum grain (milo).
- Electric Generation: Transmission, and or distribution of electric energy.
- Flour and other Grain Mill Products-except rice.
- Reconstituted Wood Products: Hardboard, particleboard, insulation board, and many similar products.
- Chemicals and Chemicals Preparations:-NOC fatty acids, essential oils, gelatin (except vegetable), many other materials.
- Prepared Foods:-Various Food items-dry, powdered foods.
- Electroplating:-Plating, Polishing, Anodizing, and Colouring (polishing & Tumbling).
- Pharmaceutical Preparations.
- Wood Products.
- Sawmills and Planing Mills.
- Cane Sugar Refining.
- Beet Sugar Manufacturing.
- Mechanical Rubber Goods-Molded, Extruded and Lathe-Cut.
- Motor Vehicle Parts and Accessories: Numerous items including wheels and transmission housings.
- Crop preparation for market except cotton gins (cleaning, shelling, delinting).
- Dry Bakery Products-Cookies, crackers, pretzels and similar.
- Flavoring extracts, syrups, powders and related.
- Fabric mills, broadwoven manmade fibres and silk (weaving fabrics>12 inches wide).
- Fabric Finishers, broadwoven manmade fibres and silk (includes napping, sueding, teaseling).
- Textile goods (many materials including waste, kapok, felt, recovered fiber).
- Millwork.
- Wood kitchen cabinets.

- Structural wood members.
- Prefabricated wood buildings and components.
- Wood household furniture, except upholstered.
- Window blinds and shade and drapery hardware.
- Industrial inorganic chemicals.
- Plastics, synthetic resins, and elastomers (nonvulcanizable).
- Cellulosic manmade fibers.
- Soap and Detergents, except specialty cleaners.
- Paints, varnishes, lacquers, enamels, and allied products.
- Manufacturing Industries:-includes many products such as matches, candles; lamp shades; feathers; artificial trees and flowers.
- Farm product warehousing and storage.
- Sanitary treatment facilities.
- Refuse systems.
- Scrap and waste materials recycling.
- Plastic Materials and basic forms and shapes.

Information in this article is Extracted From Occupational Safety and Health Administration – USA (OSHA ) on Combustible Dust Training Programs.

NFPA: National Fire Protection Agency - USA

