

LOSS PREVENTION BULLETIN

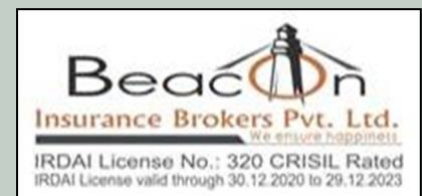


COMBUSTIBLE DUST HAZARD

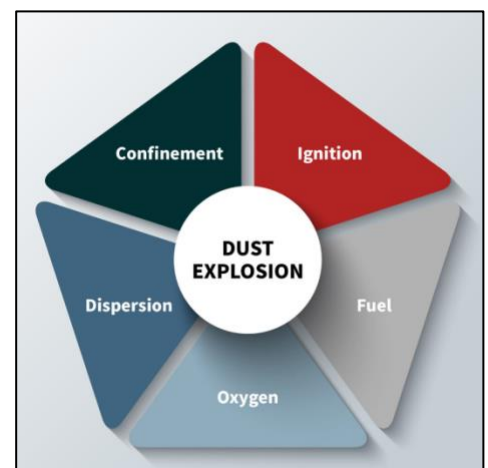


Disclaimer – This article is an initiative by Beacon to build a safe workplace environment.
This is provided for informational purposes only with a sole purpose to reduce the possibility of any loss, by bringing your attention certain potential hazards or conditions. You must make the decision whether to take any action. Beacon undertakes no responsibility to any party by providing this Loss Prevention Bulletin or performing the activities on which it is based.

BEACON INSURANCE BROKERS PVT LTD

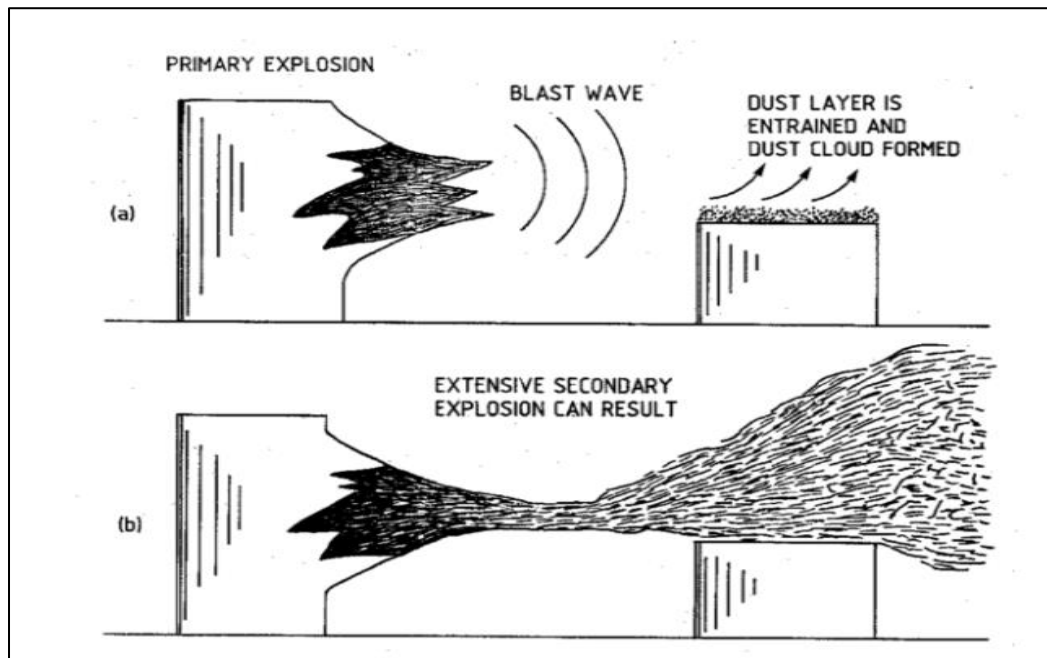


- ❖ A fine solid particle having explosion hazard when it suspended in air under certain conditions known as combustible dust. Combustible dusts are often either organic or metal dusts or combustible / hazardous materials that are finely ground into very small particles, fibers, fines, chips, flakes or a small mixture of these.
- ❖ Dust explosion is the explosion from a high concentration of fine combustible particles in the air ignited inside an enclosed premises. In other words, factors such as the proper concentration level of combustible dust, oxygen, confined space and an ignition source must be present for a dust explosion to happen.
- ❖ Below are the some examples of the combustible dust or dust hazard industries:
 - 1) Metal powders (I.e. Aluminum, Iron, cadmium, Zinc etc.)
 - 2) Coal dust (I.e. Coal mining areas, Coal storages etc.)
 - 3) Wood dust / paper dust
 - 4) Pharmaceutical dust
 - 5) Chemical dust
 - 6) Plastic dust (I.e. Epoxy resin, Ethylene, Propylene etc.)
 - 7) Furniture manufacturing facilities / Rubber manufacturing plants
- ❖ Combustible dust mainly received as by product from the manufacturing process which involves combustible raw materials.
- ❖ Dust explosion could happen in various parts of a facility, such as silos, conveying systems including bucket elevators, dust collectors, mills, etc.
- ❖ An elements which are necessary to create dust explosion hazard known “Dust hazard pentagon”.
 - 1) Ignition source (I.e. Fire, Heat etc.)
 - 2) Oxygen in air (As oxidizer)
 - 3) Combustible dust (As fuel)
 - 4) Dispersion (In air)
 - 5) Confinement (of dust cloud)



If one of the above mentioned element missing then explosion hazard can't be considered.

- ❖ Combustible dusts can be involved in layer fires or flash fires (Primary & Secondary explosions) due to suspended dust clouds and explosion. All of these events can damage amenities, equipment and can cause liability hazard also.
- ❖ Primary dust explosion occurs at area where combustible dust present in the air. It is relatively small and creates strong turbulence in the surroundings and occurs in process areas. As we know that suspended dust particles creates dust cloud and resulted in the secondary explosion. Time gap between primary and secondary explosion generally very short.



- ❖ The intensity of ignition and explosion are measured by the few physical properties of the combustible dust as mentioned below:
 - MIE – Minimum ignition energy defined as minimum energy that predicts ease of ignition of dispersed dust cloud.
 - MEC – Minimum explosible concentration defined as minimum amount of dispersed dust in air for spreading an explosion.
 - K_{st} – Dust deflagration index measures the relative explosion severity compared to other dusts.

- ❖ Below are few examples of K_{st} values of different types of dusts:

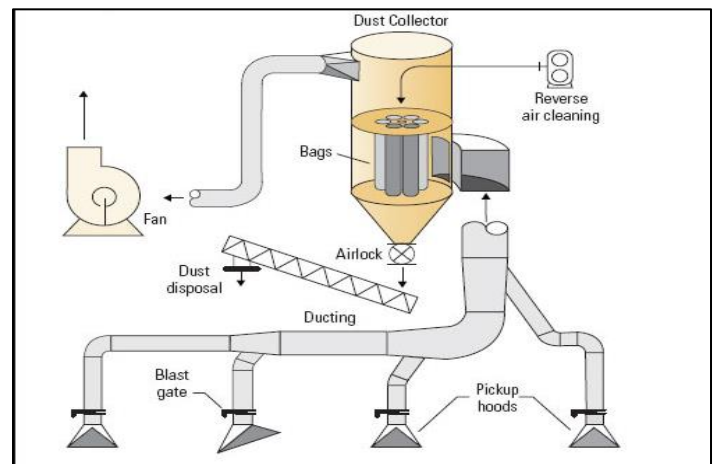
Kst value (bar. m/sec)	St class (Dust explosion class)	Remarks	Examples
0	St 0 (Class 0)	No explosion	Sand
Between 1 and 199	St 1 (Class 1)	Weak explosion (relative term)	Sulfur, sugar, lignite
Between 200 and 299	St 2 (Class 2)	Strong explosion	Wood flour, phenolic resin
300 and above	St 3 (Class 3)	Very strong explosion	Aluminium, magnesium, anthraquinone

How to recognize combustible Dust hazard:

- Particle size of dust generated in as by product in manufacturing
- Nature of materials used in the process and relative dust hazard
- Method of dispersion
- Ventilation system in the premises
- Presence of ignition sources within area
- Chances of static currents
- Areas where dust can be accumulated etc.

Safety measures to Avoiding / Prevention of dust explosions:

- Implement dust hazard inspection, testing and control program in the factory.
- A simple screening test to determine the risk of dust explosion during the process condition is to perform area air sampling to determine the dust cloud concentration. The result can be used to determine the relative risk comparing the MEC of the material.
- Proper dust collection system needs to be installed in the factory which not accumulated dust in work area.



- Dust collectors, dust system or productions machineries needs to be properly grounded and bonded from the prevention of static electrical fault.
- Dust collectors should be located outside the buildings which will reduce the secondary explosion hazard.
- The dust collector systems have spark detection and explosion suppression systems.
- Regular inspection of dust collection in open as well as hidden areas.
- The working surfaces are designed in a manner to minimize dust accumulation and facilitate cleaning as well as ensure that present dust are outside the combustible dust limits.
- The use of nitrogen gas as an inert blanket offers an effective approach to preventing combustible dust explosions by displacing the oxidant required for an explosion. Nitrogen inerting is a practical solution to help prevent the devastation to personnel and property that can result from combustible dust explosions.
- Ignition sources inside the process areas must be used with proper precautions.
- Work permit with all required safety steps needs to be followed.
- Do not use booms or compressed air hoses to clean surfaces, only use vacuums for dust collections.
- Use spark proof spanners in the factory for engineering works or in the process area.
- Ignition control program should be implement in the factory as grounding and bonding of the equipment's from the prevention of static charge.
- “No smoking” signs should be posts in all hazard prone areas.
- MSDS's of the materials which generate combustible dust are displayed at particular areas in local and English language also and exposure should be informed to all the workers.



- Fine dust can be controlled by addition of liquid from the hazard exposure (mainly in food & paper industries).
- All the emergency exits are informed to all the employees in case of emergency exit.
- Emergency action plan should be made in the factory.
- Rooms, buildings, or other enclosures (dust collectors) have explosion relief venting distributed over the exterior wall of buildings and enclosures.
- Automatic dust explosion suppression system should be present in the factory.



Standards on Combustible dust management:

- SS 667-2020, Code of practice for handling, storage and processing of combustible dust
- NFPA 652, Standard on the Fundamental of Combustible Dust, 2016
- NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities, 2017
- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 664, Standard for the Prevention of Fires and Explosions in wood processing and wood working facility.

Case Study – Dust Explosions:

Incident 1:

Type of industry – Steel manufacturing plant

Incident date – April 2020

Location – Pennsylvania, USA

Cause of loss – Dust explosion

Incident brief –

- One of the manufacturing process involves dealing with titanium and cadmium powder which having combustible in nature.
- Explosion occurred in the machine having both of these chemicals present. Although machine's suppressor system helped to prevent the fire to another areas of the plant.
- Three workers were taken to the hospital with non-life threatening inhalation-related injuries.

Incident 2:

Type of industry – HSAW & LSAW Pipes manufacturing with Plastic & Adhesives coating

Incident date – March 2020

Location – Gandhidham, Gujarat

Cause of loss – Fire in dust collector equipment of Coating section

Safety provisions after incident:

- Earlier dust line was spiral type which replaced by MS Pipe with heavy wall thickness
- Duct line system transferred to separate area with RCC partition from the process block.
- CO2 flooding system installed at the particular area.
- DCS based system installed for coating process.

References:

- 1) <https://www.osha.gov/sites/default/files/publications/3371combustible-dust>
- 2) <https://dustsafetyscience.com/dust-explosion-plum-borough-pennsylvania>
- 3) <https://www.safetyandhealthmagazine.com/articles/prevent-combustible-dust-explosions>
- 4) https://en.wikipedia.org/wiki/Occupational_dust_exposure

Beacon Insurance Brokers Pvt Ltd. Introduces itself as one of the leading names amongst insurance broking companies in India.

Incorporation: January 31, 2005

Main objective: Act as composite insurance broker (Life, Non-life & Reinsurance)

Our presence: Vadodara, Ahmedabad, Ankleshwar, Surat, Rajkot, Delhi, Mumbai, Jaipur, Indore, Gift City (Gandhinagar), Bangalore, Chennai and expanding in eastern & Northern regions.

Beacon insurance has a team of qualified MBA'S, Engineer's & Professionals certified from the Insurance Institute of India. The organization is set up to develop core competency in insurance sector. We started our operations in the year 2005. Since then, beacon is effectively managing insurance portfolio of numbers of individuals, small, medium and large corporate.

Professionals with 20 - 30 years' experience in private and public sector blended with young vibrant team have come up together to emerge beacon as a one of the fastest growing insurance broking company.

We also have team of around 35 - 40 engineers from the various fields like Mechanical, Electrical, Electronics & Communication, Civil, Computer engineering & Information and Technology, that added advantage to utilize the technical knowledge.

We have our networks all over India and have in house expertise in all aspects of property, human, liability and other insurance domains. We have strong infrastructure which takes care of all needs of clients for general and life insurance. Beacon is committed to bring changes in the mindset of Indian corporate about effectiveness of implementing insurance as Risk management tool.