Explosion prevention and protection (risk management)

Many ordinary materials may give rise to an explosion in the workplace. The essential health and safety requirements described in ATEX (Atmosphere Explosif) and DSEAR (Dangerous Substances and Explosive Atmosphere Regulations 2002) directives call for an integrated risk management approach to explosions, using prevention methods to ensure that conditions under which an explosion becomes possible do not occur and protection methods aimed at minimizing the effects of an explosion

An explosion may result from the rapid combustion of a dust or powder in air suspension, a flammable gas or vapour, or ‘mist’ of flammable liquid. Numerous explosions occur in industry every year are literally everyday events worldwide.

The selection of appropriate prevention and protection techniques, and a record of the reasoning behind their application, defines the basis of safety for the plant and process.

Prevention

• Replace the flammable material with non-flammable one. For example, substitute the use of a (non-flammable) degreasing cleanser in place of solvent.
• Minimize the handling of dusty materials and design transport systems to reduce the amount of dust generated to a minimum.
• Avoid the accumulation of dust which can be disturbed to form a dust cloud by careful design of the plant and process. Dust extraction at tip points, for example, can be used to contain dust within the plant equipment.
• Avoid explosible dust or gas concentrations by operating outside of the explosive region.
• Carry out the process under an inert gas (such as Carbon Dioxide or Nitrogen)
• Remove all possible sources of ignition as reasonably practicable.

Protection

Protect against the effects of an explosion by utilising one of the following methods:

• Explosion venting
  Letting the pressure of an explosion out through a hole in the vessel wall.
  
  **Advantages:**
  Relatively cheap
  
  **Disadvantages:**
  Vent should be ducted outside. Not suitable for use with toxic products.
  
  **Code of practice:**
  IChemE Guide Dust Explosion Prevention and Protection, NFPA 68 (American standard), prEN 14491 (European standard)

• Containment
  Constructing the plant vessel in such a manner that it is physically strong enough to withstand the full explosion pressure (typically 8-10 bar g)
  
  **Advantages:**
  No ducting to outside required
  
  **Disadvantages:**
  More expensive than venting, proof test may be required. Explosion isolation must be considered.
  
  Codes of Practice: PD 5500:2003, ASME Section 8 (American standard), prEN 14460 explosion resistant equipment (European standard).
**Explosion suppression**

Fitting vendor supplied detectors and suppressors to the protected vessel. Should an explosion occur, the system detects the excess pressure created and suppresses the combustion before any damage is done.

**Disadvantages:**
More expensive than venting and regular maintenance visits required.

**Codes of practice:**
IChemE Guide Dust Explosion Prevention and Protection, NFPA 69 (American standard), prEN 14373 explosion suppression systems (European standard)

**Please see our dust web page for a full list of BRE’s dust services including:**
- Dust or powder testing
- DSEAR Consultancy
- Risk assessment and hazard identification
- Hazardous area zoning
- DSEAR—Staff and safety training in fire and explosion awareness (health and safety)
- Explosion prevention and protection (risk management)
- Equipment for use in hazardous areas
- HAZOP for DSEAR/ATEX compliance

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**PROTECT PEOPLE, PROPERTY AND THE PLANET**

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- researching and writing standards
- testing and certification in the areas of fire, electronics, security, and sustainability
- undertaking research and consultancy for clients and regulators
- promulgating standards and knowledge throughout the industry through publications and events
- developing and delivering training

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