Managing Combustible Dust

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Why Are We Here Today?

- To become aware of the hazards of **Combustible Dust** in the Pulp & Paper industry.
- Learn what can be done to minimize the risks.
- Discuss what companies are doing to protect themselves from combustible dust hazards.
- Brief overview of regulations and standards.
Combustible Dust Video –
U.S. Chemical Safety Board (CSB)
Employee’s death “preventable”

A 57-year-old general mechanic was removing burned filter bags of combustible fly ash dust from a dust collector in the facility’s power plant and replacing them with new bags when the fly ash ignited. He sustained severe burns as a result and subsequently died.

The agency opened its inspection on Jan. 24, 2015, and found that --- failed to supply the employee with necessary fire-resistant clothing and did not train him and employees on the specific physical hazards of combustible fly ash.

In addition, the system for conveying and collecting the fly ash was deficient. It had not been inspected for defects, did not comply with National Fire Protection Association standards and had not been maintained adequately.
What are Combustible Dusts?

**Combustible dusts** are small particles found in our workplace that under certain conditions can cause serious harm:

- Small particle size
- Will ignite
- Can cause flash fire (Deflagration)
- Can also cause explosion

*The smaller and drier the dust particle the more hazardous the dust.*
The Fire Triangle graphically represents the three conditions necessary for a **combustible dust fire**:

1. **FUEL**
   - Combustible Dust

2. **IGNITION**

3. **OXYGEN**
   - Air

What are some potential **combustible dust sources** at Pulp & Paper facilities?
Any dust that will “burn” is a combustible dust.

- Wood
- Paper
- Coal
- Petroleum coke (Petcoke)
- Tire-Derived Fuel (TDF)
- Boiler/fly ashes
- Resins
- Starch
Ignition Sources

- Open flames
- Hot surfaces
- Mechanical sparks
- Hot slag
- Embers
- Lighting
- Heaters
- Equipment surfaces
- Overheated bearings
- Electrical sparks and arcs
- Electrostatic discharge
- Friction
- Electrical equipment not approved for dust locations

Photos by CV Technology
If dispersion of dust (create a dust cloud) is added to the fire triangle, it can result in a combustible dust deflagration (flash fire).

1. Fuel
2. Ignition
3. Oxygen
4. Dispersion of dust

Source: NFPA 652
A minimum exposable concentration of dust must be present for a deflagration (flash fire) to occur. If you can’t see through the dust cloud this may present a deflagration (flash fire) risk.
For a **combustible dust explosion**, there is one more required condition needed: **confinement** of the dust.

A deflagration (flash fire) occurring within a confined area or space can lead to an **explosion** due to a rapid pressure increase.

**Combustible Dust - Explosion**

1. **FUEL**
   - Combustible Dust

2. **IGNITION**
   - Spark, Hot Surface or Flame

3. **OXYGEN**
   - Air

4. **DISPERSION**
   - Dust Cloud Generated, After an Initial Explosion or Compressed Air

5. **CONFINEMENT**
   - Closed Room, Process Equipment, Ducts or Pipes

**Source:** NFPA 652

**FIRE**

**DEFLAGRATION (FLASH FIRE)**

**EXPLOSION**

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Potential locations where confinement can occur include:

- Dust collectors, silos, blending/mixing tanks
- Ducts
- Fan housings
- Buildings
Two Categories of Explosions

Primary explosion occurs in equipment or a confined space.

If accumulated dust in the area (just a fraction of inch) on floors, beams or other horizontal surfaces is dislodged and ignited a secondary explosion will occur. These secondary explosions can be far more destructive than primary explosions.
How are Combustible Dust Hazards controlled?

- Remove one side of the fire triangle
  - Housekeeping
  - Remove ignition sources

- Proper dust collection system....
  - Design
  - Operation
  - Maintenance

- Others?
Ensure dust collection and conveyance systems are designed and maintained properly to prevent a primary explosion.

- Passive (explosion venting, etc.)
- Active (isolation or suppression systems, etc.)

**Must know properties of the dust**

- Ensure vents are sized properly
- Ensure active systems are designed properly
Housekeeping Removes the Dust Fuel

Keep combustible dusts accumulations to a minimum with frequent cleaning.

Clean all:

- Walls
- Floors
- Horizontal surfaces
- Ducts
- Pipes
- Hoods
- Ledges
- Cable trays
- Concealed surfaces above suspended ceilings, interior of electrical enclosures and high above on ledges and beams.
Dust Clean Up Methods

**Preferred Methods**
- Wet methods – water hoses (*not fire water*)
- Vacuuming – if approved for combustible dust locations
- Light sweeping

**Methods to Avoid**
- Aggressive sweeping
- Blow down with compressed air

*Blow downs with compressed air may be allowed if done frequently enough that large dust clouds are not created.*
Housekeeping Tip

*From NFPA 654*

LD (in) = ((1/32 in)(75 lb/ft³)) / BD (lb/ft³)

LD = Layer Depth
BD = Bulk Density

If you can write your name in the dust, see footprint, or not see the paint on equipment – you probably have too much dust.
OSHA announces development of a combustible dust standard
- Published on December 7, 2009

OSHA not likely to issue new rule any time soon

Combustible Dust National Emphasis Program
- CPL 03-00-008

OSHA can (and will) cite other standards. Examples...
- Housekeeping
- Emergency action plans
- Ventilation
- Electrical - hazardous (classified) locations
- Hazard communication
- Personal protective equipment
- General Duty Clause
States with Combustible Dust Standards

- Georgia
- Washington
- Oregon
- Indiana
- North Carolina
- California
Standard on the Fundamentals of Combustible Dust

- Effective Date: September 7, 2015
- General requirements for managing combustible dust
- Key Elements
  - Determining combustibility
  - Identifying the hazards
  - Managing the hazards
  - Communicating the hazards
Dust Hazard Analysis (DHA)

- Very similar to a Process Hazard Analysis (PHA)
- Break system down into nodes
- Determine if:
  - Not a hazard
  - Maybe a hazard
  - Deflagration hazard
- Assess needs for engineering or other controls
NFPA 652 - 2015

Hazard Identification (screening/sampling)
Dust Hazard Analysis (DHA)
Hazard Management
  - Building/Equipment Design
  - Housekeeping
  - Ignition Source Control
  - Personal Protective Equipment
  - Dust Control
  - Explosion Prevention/Protection
  - Fire Protection

Management System
  - Operating procedures
  - Inspection, testing, maintenance
  - Training & hazard awareness
  - Contractors
  - Emergency planning and response
  - Management of change (MOC)
  - Document retention
  - Management systems review (periodic)
  - Employee participation

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Questions?

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