Combustible Dust Issues

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Hazard Recognition

- Always the key to the game!
  - Dust Hazard?
Hazard Recognition

- How about now?
Hazard Recognition

- What about here?
The Basic Requirements for an EXPLOSION

Dust Explosion Pentagon

- Ignition Source
- Fuel (Combustible Dust)
- Oxygen
- Confinement of dust cloud in equipment or building
- Dust Dispersion at or greater than dust’s MEC
Some event disturbs the settled dust into a cloud. The dust cloud is ignited and explodes.
At Risk?

- Perform an assessment and identify if...
  - The material is combustible when finely divided
    - Will the material ignite and combust
At Risk?

These dusts include, but are not limited to:

- Metal dust such as steel, aluminum, and magnesium
- Wood dust
- Coal and other carbon dusts
- Plastic dust and additives
- Biosolids
- Other organic dust such as sugar, flour, cocoa, paper, soap, and dried blood
- Certain textile materials
At Risk?

- Perform an assessment and identify if...
  - A process can produce finely divided materials
    - The hazard increases as the particle size decreases
At Risk?

- Perform an assessment and identify if...
  
  - There are areas where dust may build up
    
    - Look up and down for flat surfaces
At Risk?

Perform an assessment and identify...

- Hidden areas where dust may collect unnoticed
  - Inside equipment
  - Suspended ceilings
At Risk?

- Perform an assessment and identify if...
  - Any methods that may cause the finely divided material to become suspended in the air
At Risk?

- Rules of thumb
  - Can you write in it?
  - Does it obscure the color of the surface?
  - Is it thicker than a paper clip (1/32\textsuperscript{nd} of an inch)?
Hazard Control - Fuel

- Can the material be changed?
  - Particle size
  - Shape
  - Moisture content
  - Changes caused by process equipment

- Use different sources to determine combustibility
  - Test data
    - As used
    - Chemical supplier
  - MSDS sheet information
  - Published tables
## Hazard Control - Fuel

### Agricultural Products
- Egg white
- Milk, powdered
- Milk, nonfat, dry
- Soy flour
- Starch, corn
- Starch, rice
- Starch, wheat
- Sugar
- Sugar, milk
- Sugar, beet
- Tapioca
- Whey
- Wood flour

### Agricultural Dusts
- Alfalfa
- Apple
- Beet root
- Carrageen
- Carrot
- Cocoa bean dust
- Cocoa powder
- Coconut shell dust
- Coffee dust
- Corn meal
- Cornstarch
- Cotton
- Cottonseed
- Garlic powder
- Gluten
- Grass dust
- Green coffee
- Hops (malted)
- Lemon peel dust
- Lemon pulp
- Linseed
- Locust bean gum
- Malt
- Oat flour
- Oat grain dust
- Olive pellets
- Onion powder
- Parsley (dehydrated)
- Peach
- Peanut meal and skins
- Peat
- Potato
- Potato flour
- Potato starch
- Raw yucca seed dust
- Rice dust
- Rice flour
- Rice starch
- Rye flour
- Semolina

### Soybean dust
- Spice dust
- Spice powder
- Sugar (10x)
- Sunflower
- Sunflower seed dust
- Tea
- Tobacco blend
- Tomato
- Walnut dust
- Wheat flour
- Wheat grain dust
- Wheat starch
- Xanthan gum

### Carbonaceous Dusts
- Charcoal, activated
- Charcoal, wood
- Coal, bituminous
- Coke, petroleum
- Lampblack
- Lignite
- Peat, 22%H₂O
- Soot, pine
- Cellulose
- Cellulose pulp
- Cork
- Corn

### Chemical Dusts
- Adipic acid
- Anthraquinone
- Ascorbic acid
- Calcium acetate
- Calcium stearate
- Carboxy-methylcellulose
- Dextrin
- Lactose
- Lead stearate
- Methyl-cellulose
- Paraformaldehyde
- Sodium ascorbate
- Sodium stearate
- Sulfur

### Metal Dusts
- Aluminum
- Bronze
- Iron carbonyl
- Magnesium
- Zinc

### Plastic Dusts
- (poly) Acrylamide
- (poly) Acrylonitrile
- (poly) Ethylene
  - (low-pressure process)
- Epoxy resin
- Melamine resin
- Melamine, molded
  - (phenol-cellulose)
- Melamine, molded
  - (wood flour and
    mineral filled phenol-
    formaldehyde)
- (poly) Methyl acrylate
- (poly) Methyl acrylate,
  emulsion polymer
- Phenolic resin
- (poly) Propylene
- Terpene-phenol resin
- Urea-formaldehyde/ 
  cellulose, molded
- (poly) Vinyl acetate/ 
  ethylene copolymer
- (poly) Vinyl alcohol
- (poly) Vinyl butyral
- (poly) Vinyl chloride/ 
  ethylene/vinyl 
  acetylene suspension 
  copolymer
- (poly) Vinyl chloride/ 
  vinyl acetylene 
  emulsion 
  copolymer
Hazard Control - Fuel

- Wood 34%
- Other 6%
- Paper 2%
- Metals 10%
- Coal/Peat 10%
- Synthetics 14%
- Grain 24%
Hazard Control - Ignition

- Use appropriate electrical equipment and wiring methods (Class I & II)

- Control
  - Static electricity
  - Smoking
  - Open flame
  - Sparks
  - Other hot work
Hazard Control - Ignition

- Static Electricity: 9%
- Friction: 9%
- Fire: 8%
- Hot Surfaces: 6.5%
- Self-Ignition: 6%
- Welding: 5%
- Electrical Equipment: 3.5%
- Smolder Spots: 9%
- Unknown: 11.5%
- Other: 2.5%
- Mechanical Sparks: 30%
Hazard Control - Ignition

- Adequately maintain equipment in dusty areas
- Proper type of industrial trucks
- Proper use of cartridge-activated tools
Hazard Control - Confinement

- Can the process be moved to a less confined area?
- Provide access to all hidden areas to permit inspection
- Inspect areas regularly
- Clean areas regularly
Hazard Control - Oxygen

Sorry, still enjoy breathing!
Hazard Control - Dispersion

- Minimize the escape of dust from process equipment
- Use dust collection systems
- Use surfaces that minimize dust accumulation
Training - Employees

- Recognize and prevent hazards
- Empowered to take preventative action
- How to alert management to a hazard
Training - Employees

- Safe work practices and procedures for their job tasks
- Must take place **before** an employee starts work as a part of HazCom
Training - Managers

- Understand it to be a hazard
- Have qualified personnel conduct a facility analysis
- Develop a prevention and protection program tailored to the operation
Regulations Concerning Combustible Dusts

- OSHA
  - General Duty Clause
  - 1910.22 - General Requirements: Housekeeping
  - 1910.38 - Emergency Action Plans
  - 1910.94 - Ventilation
  - 1910.272 - Grain Handling Facilities
  - 1910.307 - Hazardous (classified) Locations (for electric equipment)
  - 1910.1200 - Hazard Communication

- International Code Council’s *International Fire Code*
Regulations Concerning Combustible Dusts

- NFPA
  - NFPA 61 - Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
  - NFPA 68 - Guide for Venting of Deflagrations
  - NFPA 69 - Standard on Explosion Prevention Systems
  - NFPA 70 - National Electrical Code
  - NFPA 484 - Standard for Combustible Metals, Metal Powders, and Metal Dusts
  - NFPA 495 - Explosive Materials Code
Regulations Concerning Combustible Dusts

NFPA (Continued)

- NFPA 499 - Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- 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 Woodworking Facilities
Questions?