JULY 19-22, 2017
LAS VEGAS CONVENTION CENTER
LAS VEGAS, NEVADA

Combustible Dust… Explosive Issue

Photo: U.S. Chemical Safety Board

WE29
TRACK: SAFETY & ENVIRONMENT
Dust Collection And Combustible Dust for Secondary Wood Operations: Fundamentals and Safety

Presented By:
Jamison Scott
Executive Vice President,
Air Handling Systems

Overview

- What is Combustible Dust?
- Who's in Charge?
- Can it Happen?
- Prevention

Photo: U.S. Chemical Safety Board

What is Combustible Dust?

Examples

Air Handling Systems

What is Combustible Dust?

Examples

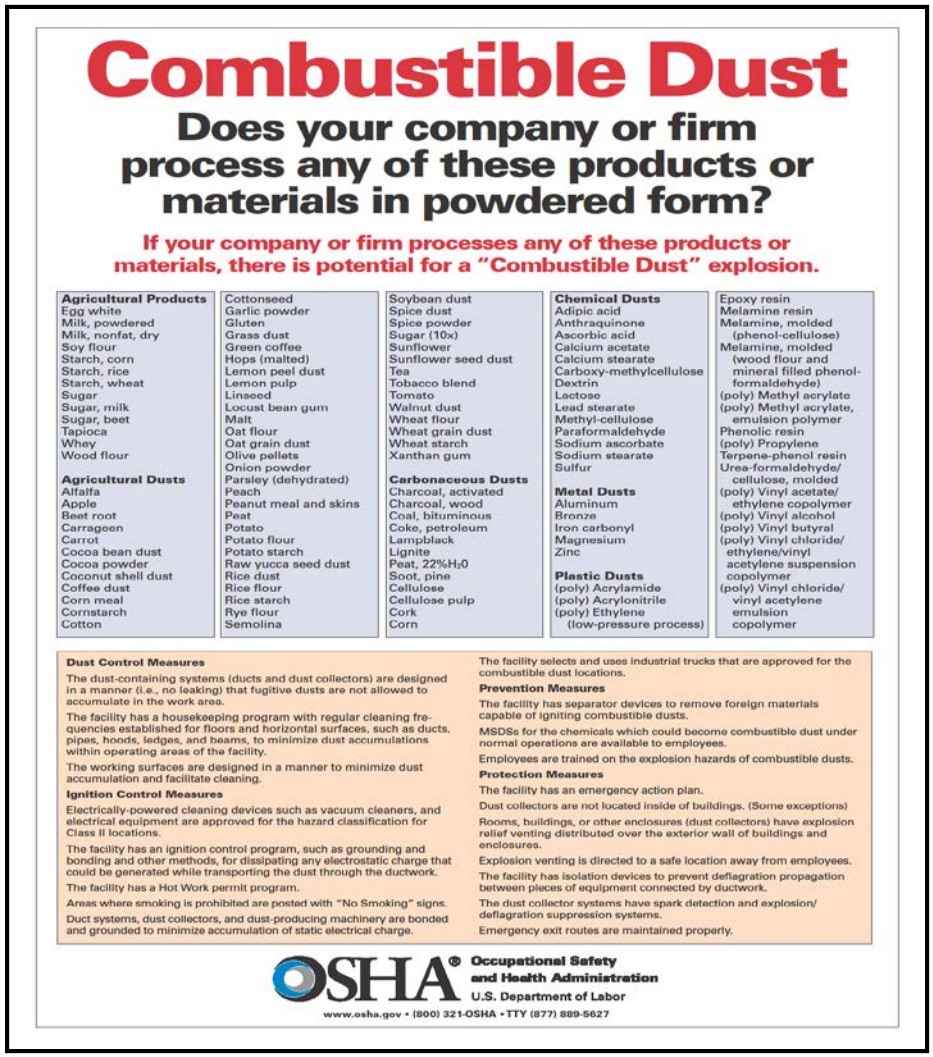
- Sawdust Cannon, courtesy of Navy Island

What is Combustible Dust?

Examples

- Mythbusters - Creamer Cannon

What is Combustible Dust?



Combustible Dust

Does your company or firm process any of these products or materials in powdered form?

If your company or firm processes any of these products or materials, there is potential for a "Combustible Dust" explosion.

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%H_20
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

Dust Control Measures

The dust-containing systems (ducts and dust collectors) are designed in a manner (i.e., no leaking) that fugitive dusts are not allowed to accumulate in the work area.

The facility has a housekeeping program with regular cleaning frequencies established for floors and horizontal surfaces, such as ducts, pipes, hoods, ledges, and beams, to minimize dust accumulations within operating areas of the facility.

The working surfaces are designed in a manner to minimize dust accumulation and facilitate cleaning.

Ignition Control Measures

Electrically-powered cleaning devices such as vacuum cleaners, and electrical equipment are approved for the hazard classification for Class II locations.

The facility has an ignition control program, such as grounding and bonding and other methods, for dissipating any electrostatic charge that could be generated while transporting the dust through the ductwork.

The facility has a Hot Work permit program.

Areas where smoking is prohibited are posted with "No Smoking" signs.

Duct systems, dust collectors, and dust-producing machinery are bonded and grounded to minimize accumulation of static electrical charge.

The facility selects and uses industrial trucks that are approved for the combustible dust locations.

Prevention Measures

The facility has separator devices to remove foreign materials capable of igniting combustible dusts.

MSDSs for the chemicals which could become combustible dust under normal operations are available to employees.

Employees are trained on the explosion hazards of combustible dusts.

Protection Measures

The facility has an emergency action plan.

Dust collectors are not located inside of buildings. (Some exceptions)

Rooms, buildings, or other enclosures (dust collectors) have explosion relief venting distributed over the exterior wall of buildings and enclosures.

Explosion venting is directed to a safe location away from employees.

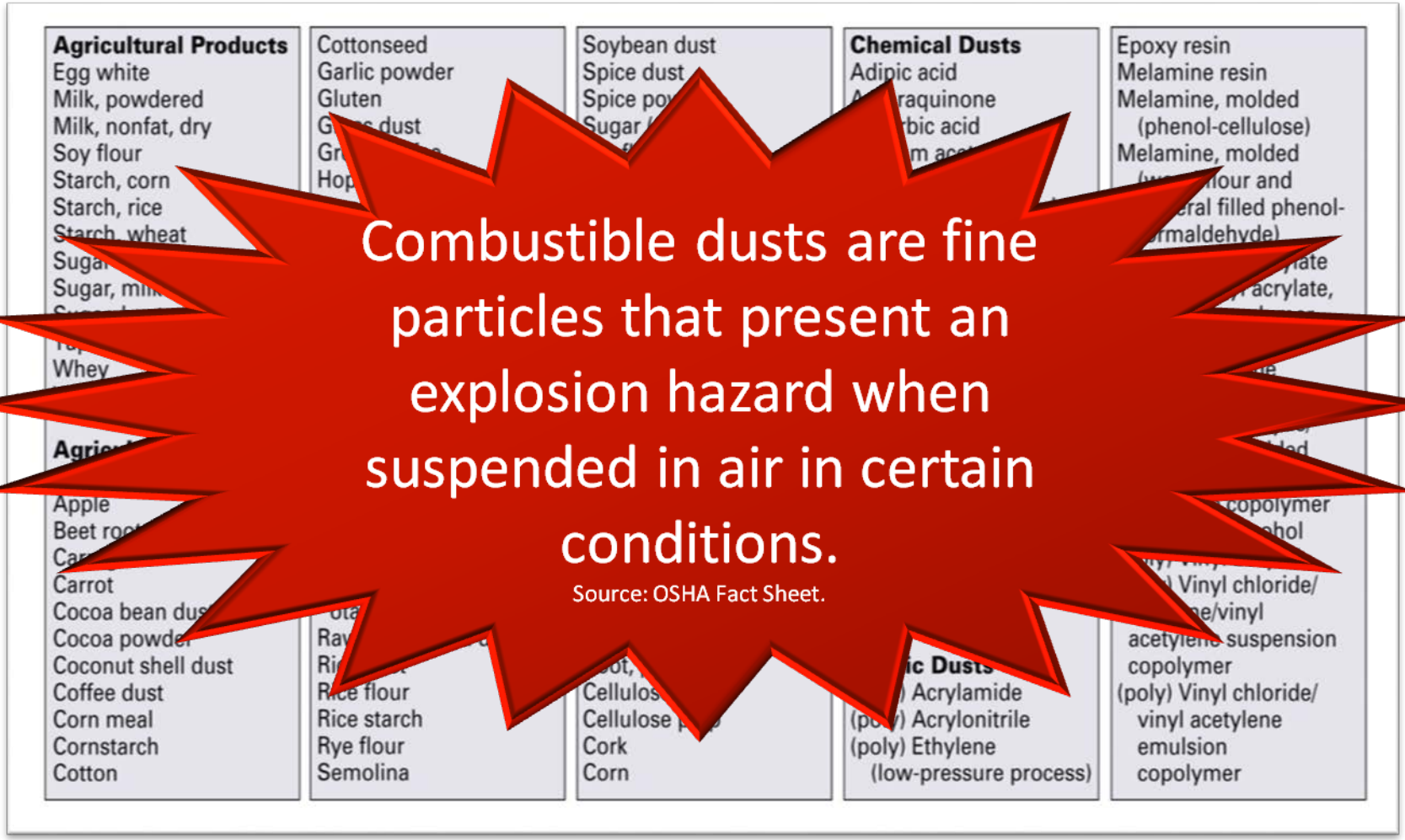
The facility has isolation devices to prevent deflagration propagation between pieces of equipment connected by ductwork.

The dust collector systems have spark detection and explosion/deflagration suppression systems.

Emergency exit routes are maintained properly.

OSHA® Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov • (800) 321-OSHA • TTY (877) 889-5627

What is Combustible Dust?



What is Combustible Dust?

Combustible Fine Particles

It is not simply defining a dust, it is determining the explosibility of the dust. Important factors include, but no limited too:

- Particle Size
- Particle Shape
- Particle Aging
- Triboelectric Attraction
- Hydrogen Bonding
- Environment

What is Combustible Dust?

Combustible Fine Particles

Additionally…

K_{st} value is used as a factor in the deflagration of your dust.

- Wood flour has a K_{st} Value of >200 and $\leq$ 300 meaning it has a **strong explosion characteristic**.

Dust explosion class rating system from St 0 – St 3

- e.g. Dust explosion class of wood flour is St 2.

NFPA defines the size of "Deflagrable Wood Dust" as **500 microns (.5 mm, 0.0196") or less** and has a **moisture content of less than 25%.** Material will pass through U.S. No. 35 Standard Sieve which is approx. the **"size of fairly coarse sand"**.
(NFPA 664 (3.3.27.1)

What is Combustible Dust?

Combustible Fine Particles

Layer Depth Criterion –

In **general mfg** – 1/32 in.+ depending on bulk density and total area. (NFPA 654-2013 6.1.3.1)

Layer Thickness Criterion –

In **woodworking facilities**, a dust layer of 1/8 in. thick (over 5% of area) can be sufficient to warrant immediate cleaning of area. (NFPA 664-2012 4.2.1)

What is Combustible Dust?

Combustible Fine Particles

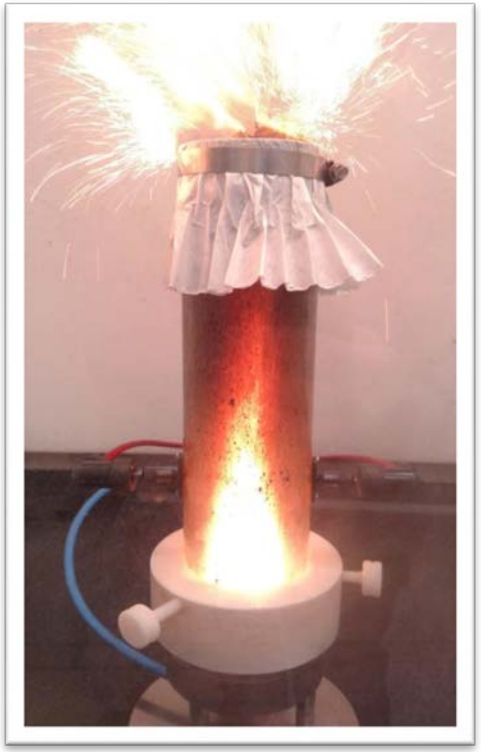
If there is any doubt of combustibility, the dust must be sent to a certified facility to be tested.

What is Combustible Dust?

Hazard Recognition/Assessment

TESTING per NFPA 652

- **"go/no/go"" test: "yes, it blows up, or no, it doesn't"** per ASTM E 1226 *Standard Test Method for Explosibility of Dust Clouds*" (NFPA 652 4.5.3.1)
- "The owner/operator of a facility with combustible particulate solids and dust shall be responsible to indentify, sample, analyze, and test materials to ensure the materials are combustible and the hazards are adequately assessed." (NFPA 652 4.4.1)
- **Testing prices ranges from $350-$1300 up to $3850 for a full OSHA NEP Package.**



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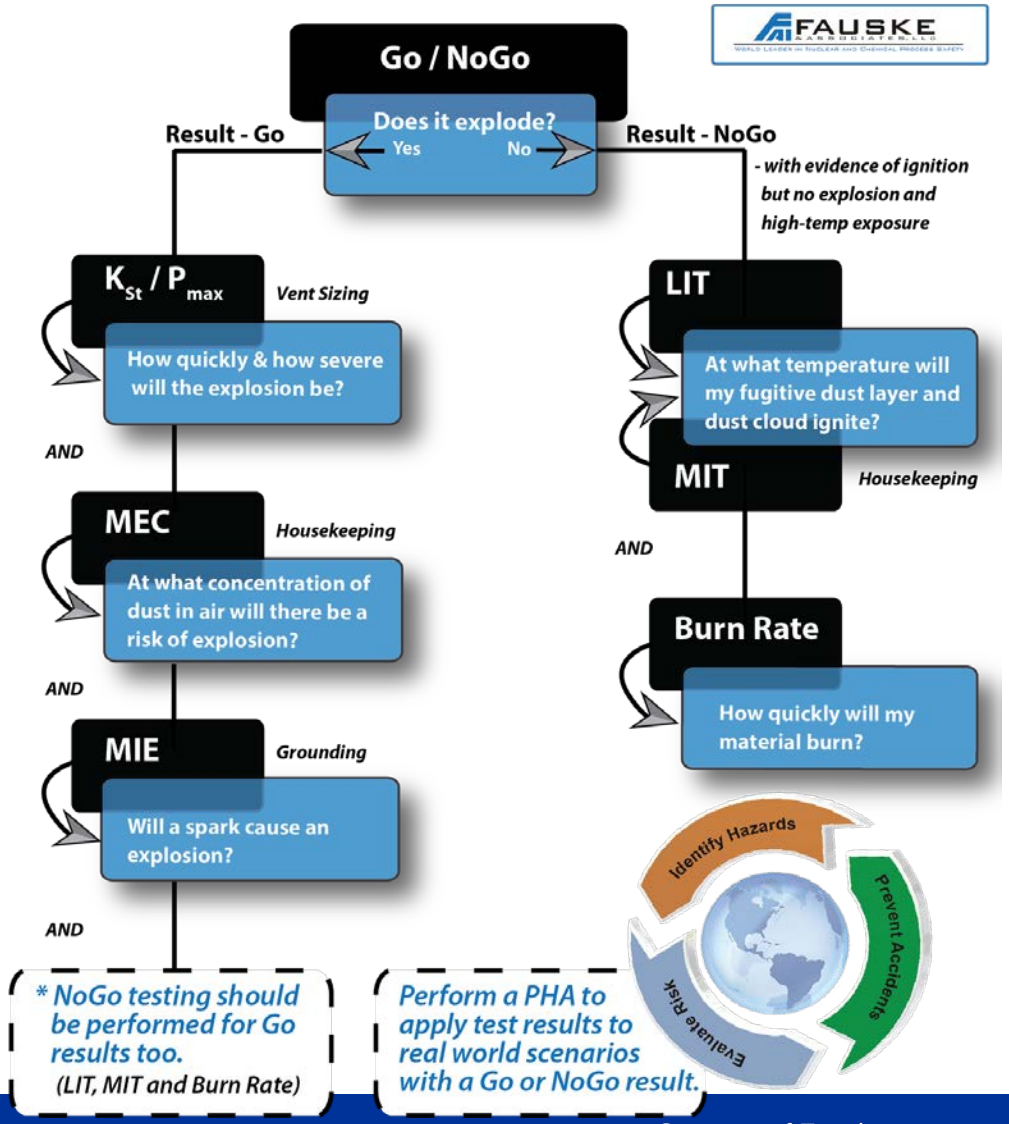
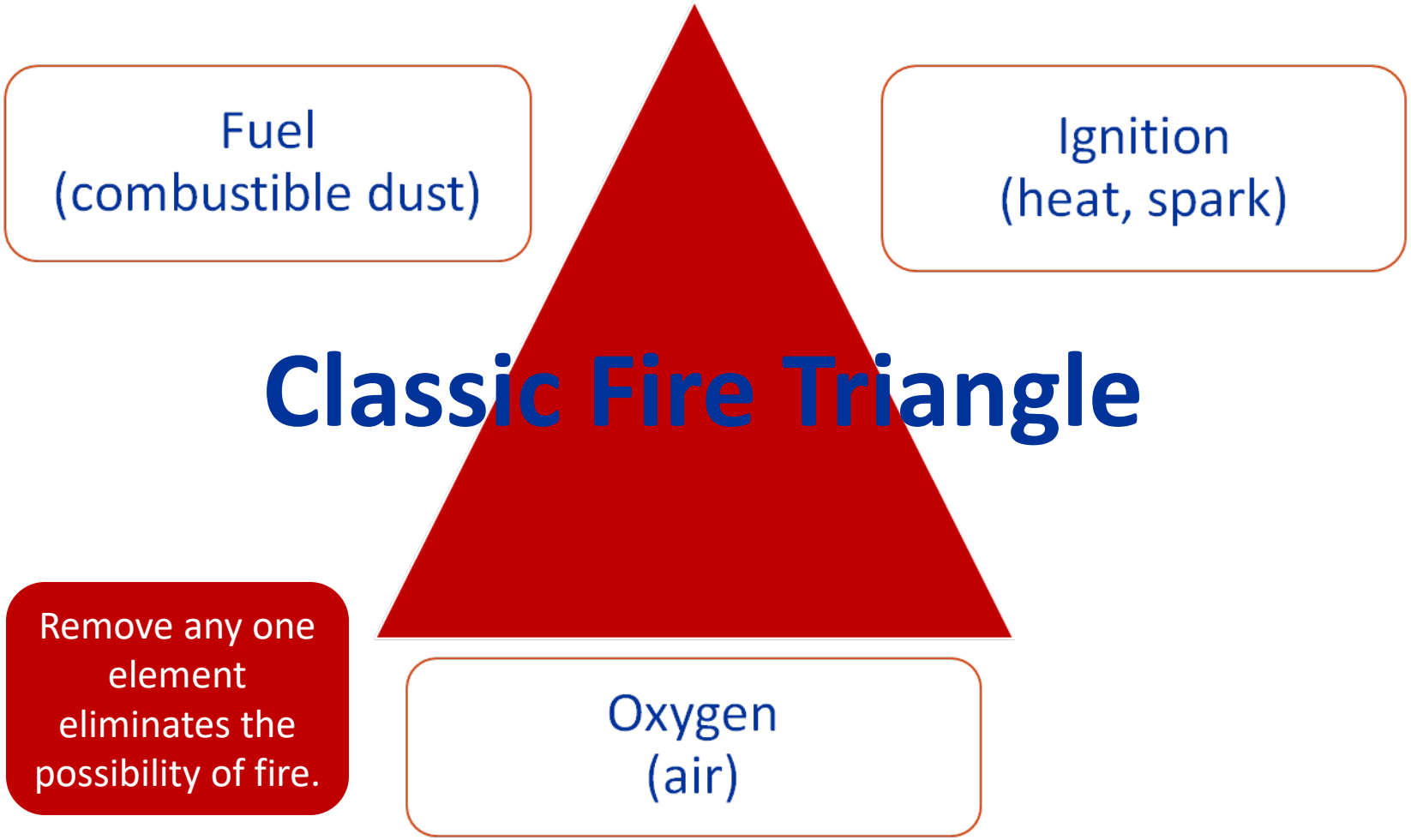


Courtesy of Fauske

What is Combustible Dust?



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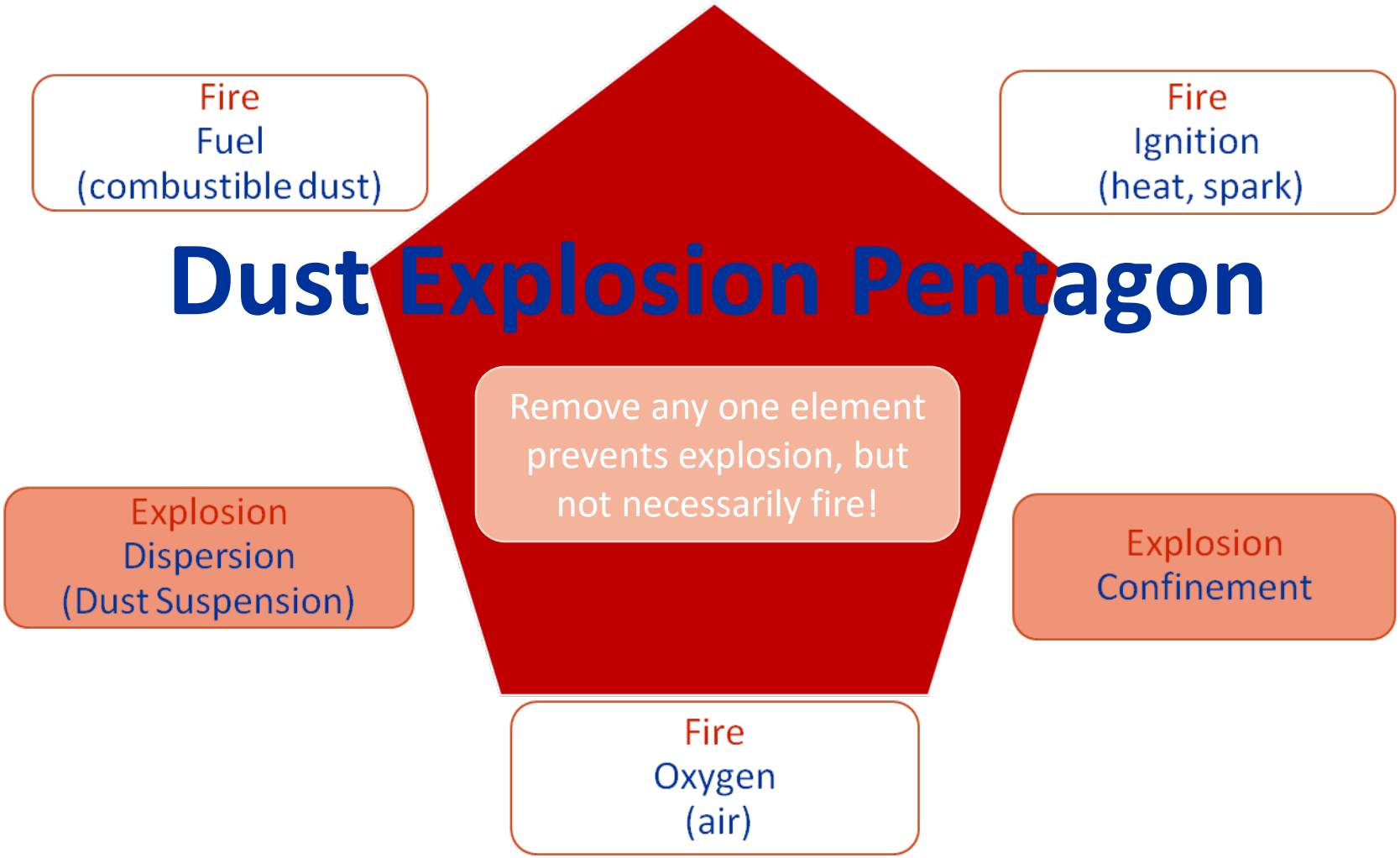
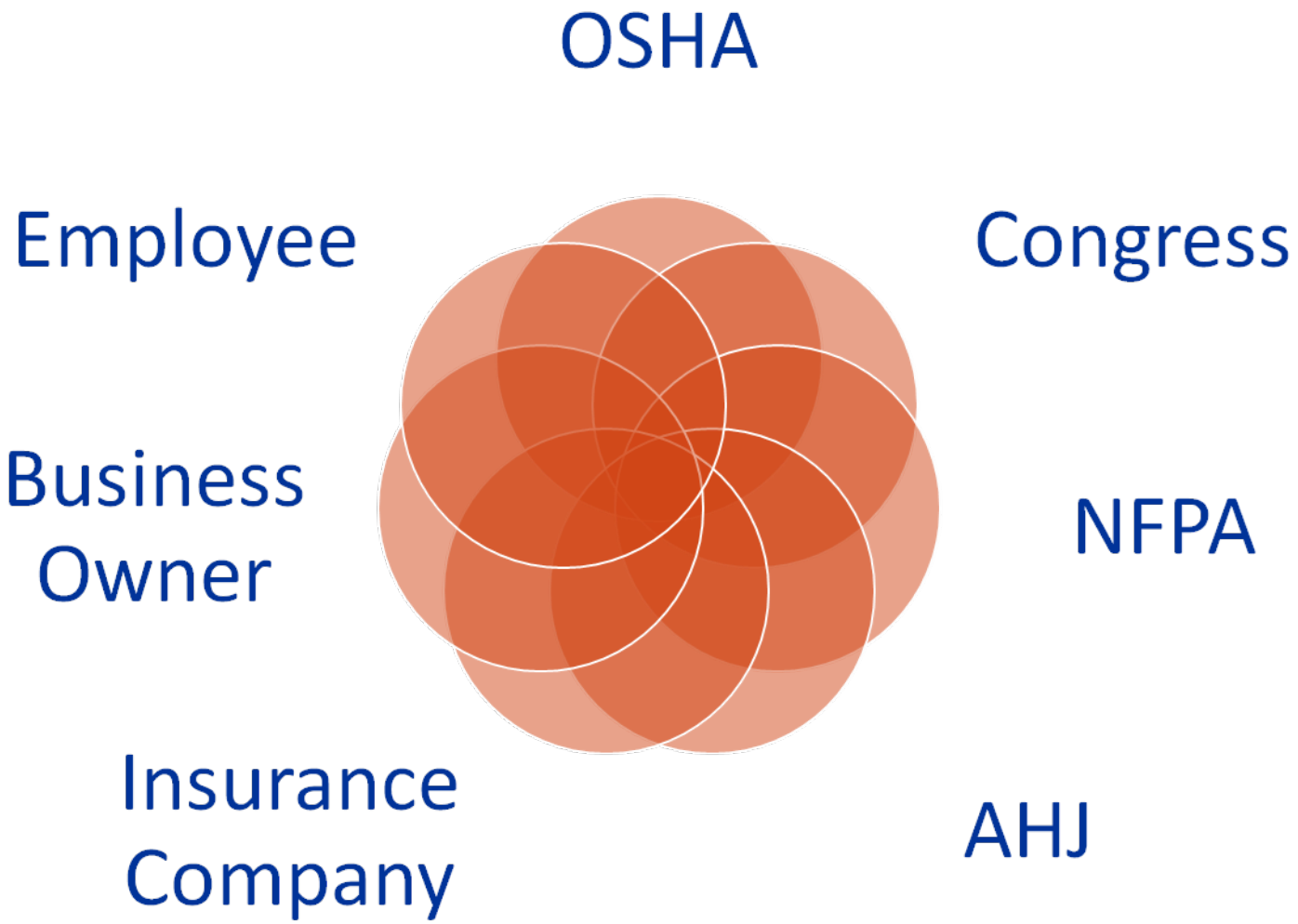


Who's in Charge?



Who's in Charge?

Regulatory Organizations & Agencies

2005 - Safety & Health Bulletin: Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions

2007 – OSHA Combustible Dust National Emphasis (NEP) Program targeted inspections on combustible dusts. Results indicated unusually high numbers of general duty clause violations, indicating a **strong need for a combustible dust standard**.

Who's in Charge?

Regulatory Organizations & Agencies

2008 - Hazard Alert: Combustible Dust Explosions. OSHA Fact Sheet

2009 - OSHA considers rulemaking (ANPRM) to develop a combustible dust standard for general industry.

2009 – OSHA hosts first in series of Stakeholder meetings in Washington DC.

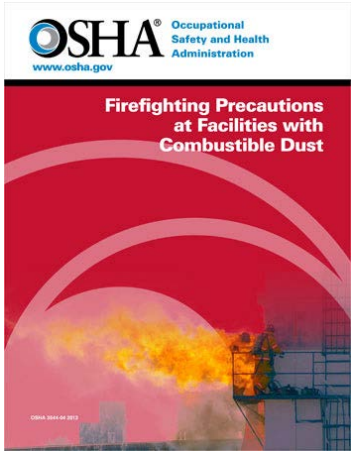
Who's in Charge?

Regulatory Organizations & Agencies

OSHA®

2013 – OSHA announces plan to finally initiate SBREFA (Small Business Regulatory Enforcement Fairness Act) meetings (currently on hold since 2014, possibly October 2016).

2013 - OSHA publication: Firefighting Precautions at Facilities with Combustible Dust



Who's in Charge?

Regulatory Organizations & Agencies

OSHA®

2013 - Updated Hazard Communication Standard

- According to OSHA - *"Hazardous chemical"* means any chemical which is classified as a physical hazard or a health hazard…**combustible dust**...

Who's in Charge?

Regulatory Organizations & Agencies

OSHA®

2015 - Evaluating Hazardous Levels of Accumulation Depth for Combustible Dusts

"The purpose of this memorandum is to provide guidance in calculating the levels of dust accumulations that may be allowed at workplaces for combustible dusts with bulk densities less than 75 lb/ft^3. "

Who's in Charge?

OSHA®

June 2016 – NEW OSHA Fact Sheet

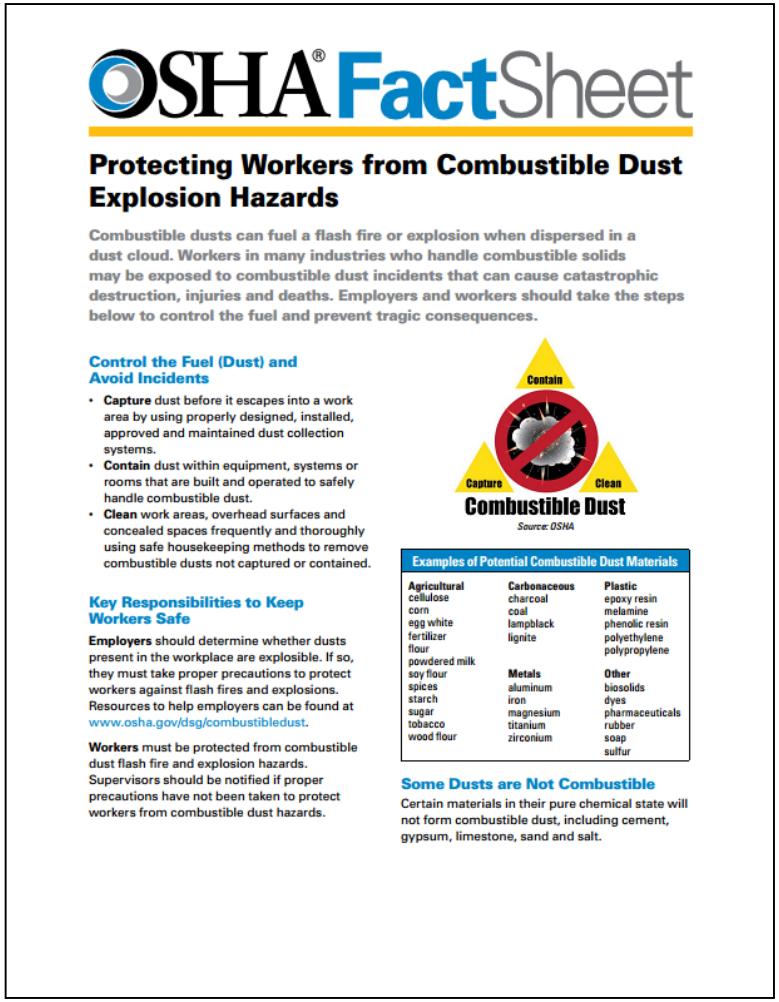
Who's in Charge?

June 2016

NEW

OSHA

Fact Sheet



OSHA® FactSheet

Protecting Workers from Combustible Dust Explosion Hazards

Combustible dusts can fuel a flash fire or explosion when dispersed in a dust cloud. Workers in many industries who handle combustible solids may be exposed to combustible dust incidents that can cause catastrophic destruction, injuries and deaths. Employers and workers should take the steps below to control the fuel and prevent tragic consequences.

Control the Fuel (Dust) and Avoid Incidents

- **Capture** dust before it escapes into a work area by using properly designed, installed, approved and maintained dust collection systems.
- **Contain** dust within equipment, systems or rooms that are built and operated to safely handle combustible dust.
- **Clean** work areas, overhead surfaces and concealed spaces frequently and thoroughly using safe housekeeping methods to remove combustible dusts not captured or contained.

Key Responsibilities to Keep Workers Safe

Employers should determine whether dusts present in the workplace are explosible. If so, they must take proper precautions to protect workers against flash fires and explosions. Resources to help employers can be found at www.osha.gov/dsg/combustibledust.

Workers must be protected from combustible dust flash fire and explosion hazards. Supervisors should be notified if proper precautions have not been taken to protect workers from combustible dust hazards.

Examples of Potential Combustible Dust Materials

Agricultural	Carbonaceous	Plastic
cellulose	charcoal	epoxy resin
corn	coal	melamine
egg white	lampblack	phenolic resin
fertilizer	lignite	polyethylene
flour		polypropylene
powdered milk		
soy flour	**Metals**	**Other**
spices	aluminum	biosolids
starch	iron	dyes
sugar	magnesium	pharmaceuticals
tobacco	titanium	rubber
wood flour	zirconium	soap
		sulfur

Some Dusts are Not Combustible

Certain materials in their pure chemical state will not form combustible dust, including cement, gypsum, limestone, sand and salt.

Who's in Charge?

Regulatory Organizations & Agencies

U.S. Congress

- 2008 – HR 5522, **Worker Protection Against Combustible Dust Explosions and Fires Act of 2008** - To require the Secretary of Labor to issue interim and final occupational safety and health standards regarding worker exposure to combustible dust...
- Reintroduced in 2013 – HR 691.
- Yet to be reintroduced.

Who's in Charge?

Regulatory Organizations & Agencies

NFPA – National Fire Protection Association – International Codes and Standards Organization that creates voluntary consensus standards.

Voluntary Consensus Standards – According to OSHA:

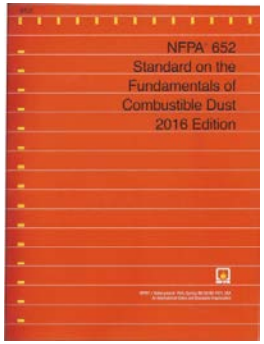
*"These standards are **NOT OSHA** regulations. However, they do provide guidance from their originating organizations related to worker protection. **In some cases, they may be mandated by state or local governments, or individual companies**."*

Who's in Charge?

Regulatory Organizations & Agencies

NFPA – National Fire Protection Association Standards

- **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 & Explosions on Wood Processing & Woodworking Facilities**
- **NFPA 652 Standard on the Fundamentals of Combustible Dusts -** "This standard shall provide the basic principles of and requirements for identifying and managing fire and explosion hazards of combustible dusts and particulate solids." *Credible Risk* by Guy Colonna, NFPA



Who's in Charge?

Regulatory Organizations & Agencies

AHJ (Authority Having Jurisdiction)

Typically government (local, state, federal or other regional) authority having jurisdiction, including but not limited too:

- Fire Marshal
- Building Inspector
- Labor Department
- Health Department
- Other Local and State Authorities
- Insurance Inspector

Who's in Charge?

Regulatory Organizations & Agencies

Insurance Companies

FM Global – Data sheet on prevention and mitigation of combustible dust

- Describes recommended preventive measures to reduce the frequency of combustible dust explosions, and protection features to minimize damage from a combustible dust explosion.

Who's in Charge?

Fred figured he didn't really need a dust collection system.

Used with permission from Steve Spiro

Who's REALLY in Charge?

YOU!!!!!!

Can it Happen?

Photo: U.S. Chemical Safety Board

Can it Happen?

1785 – First recorded dust explosion at a flour mill in Italy.

2008 - Georgia sugar refinery explosion – Imperial Sugar explosion was an industrial disaster that occurred in Port Wentworth, Georgia. **Enclosed (confined operation). Primary explosion, then secondary explosion.**

Photo: U.S. Chemical Safety Board

Can it Happen?

2011 - Mississippi mill slapped with ComDust violations - $67,800 - OSHA has cited the mill for a variety of violations, including…**electrical junction box open in an area where combustible wood dust accumulates**.

2011 - ComDust Exposure Leads to Georgia Co. Fine - $55,250 - 46 alleged safety and health hazards including worker exposure to **heavy accumulations of combustible dust.** Proposed penalties total $55,250.

2011 - Seating Company Slapped with fines for Combustible Dust - $117,600 - "Combustible dust, with its fine particulate composition, has the ability to create an explosive atmosphere…" said Area Director. "The **accumulations of combustible dust must be removed**, and a program must be put in place to prevent any potential build up from occurring."

2011 - ComDust explosion at Universal Woods injures two workers - **Workers were using a metal rod to unclog the dust collection filter when it apparently touched something causing a spark - triggering an explosion** and resulting fireball that blasted more than 50 feet into the air.

Can it Happen?

2011 - OSHA Slaps Pilgrim's Pride with fines - $85,000
…**allowed electrical components such as motors and drop lights to be subject to the accumulation of combustible dust**.

2011 - OSHA proposes fine for Opelika packaging - $54,880 OSHA violations involve improper housekeeping for **allowing up to 36 inches of combustible wood dust to accumulate**.

2011 - Fine for exposing employees to combustible dust hazards - $58,800
"**Failing to provide appropriate personal protective equipment and monitoring workers for exposure to…combustible dust** puts them at an unacceptable risk for injury and illness".

Can it Happen?

2012 - Babine Forest Products mills, Burns Lake, B.C. Blast that killed 2 workers and injured 19 others blamed on excessive wood dust

Photo: CBC News

Can it Happen?

2012 - Prince George, BC, Canada, Lakeland Mills sawmill 'ball of flame' kills 1, injures 24 (CBC Video)

- Workers say building exploded around them
- Flames at the sawmill, located about one kilometer outside the city, were reported to have shot more than 60 meters in the air.
- Some outside experts have pointed to high dust levels and limited ventilation at the mill as a possible cause.

Photo: CBC News

Can it Happen?

Photo: CBC News

Can it Happen?

2012 - Fire Breaks Out At Wood Pellet Plant – Fire officials in Jaffrey, NH were on the scene of a three-alarm.

OSHA issued its news release mere hours after the plant sustained another fire **- it's third since 2008** - that was ignited by **sparks caused by a mechanical malfunction** of a pellet mill.

Photo: OSHA

Can it Happen?

2012 - **Alabama furniture manufacturer cited by OSHA for exposing workers to combustible dust, other hazards**

25 safety and health violations. OSHA initiated an inspection in Feb. as part of the agency's **NEP on Amputations and its Local Emphasis Program on High Noise Industries**. Proposed penalties $94,500.
NOTE: Nothing related to combustible dust initiated this inspection.

19 serious safety and health violations involve:

- maintain the dust collection system to prevent potential fires or explosions; install dust collection systems in areas where combustible dust is present; ensure danger signs are posted on equipment generating combustible dust; reduce the pressure on an air hose to less than 30 psi

Can it Happen?

2013 - Cardell Cabinetry LLC has been cited for combustible dust and other safety and health violations by OSHA.

- The semi-custom cabinet company faces a penalty of $267,434 for 29 violations at the San Antonio, TX, facility.
- Cardell faces penalties of $99,000 for the **repeat failure** to ***"remove combustible wood dust, cover electrical boxes and reduce the pressure of compressed air."***
- The **repeated failure** to **remove wood dust from the parts mill area** is a $34,034 penalty for the failure-to-abate violation.
- September 9, 2013 Cardell Cabinetry closed it doors.

Can it Happen?

2014 – Albany, NY - OSHA cites cabinetry, countertop manufacturer for combustible dust, chemical hazards

- Salko Kitchens Inc. faces proposed fines of $51,800 for combustible dust and potential carcinogen exposure violations.
- *"These workers face both immediate and long-term health and safety hazards from on-site conditions,"* said OSHA's area director in Albany. *"**The combustible dust can ignite and explode in seconds. For the health and well-being of its employees, it's imperative that this employer correct these hazards and take effective steps to prevent them from happening again**."*

Can it Happen?

2014 – U.S. Chemical Safety Board: **Releases Safety Video, "Combustible Dust: Solutions Delayed"**

Charleston, WV, July 16, 2014 – CSB released its final report, safety recommendations and accompanying safety video into a fatal combustible dust explosion at the AL Solutions metal recycling facility in New Cumberland, West Virginia.

Report **reiterates a recommendation that OSHA promulgate a general industry combustible dust standard**, something the agency has been calling for since 2006.

Can it Happen?

2014 – OSHA Cites Combustible Dust at West Hartford Stairs; $60,000 Fine. Source www.woodworkingnetwork.com

- OSHA says it found that employees were exposed to fire hazards from a **dust collection system that lacked a spark detector to prevent hot metal from entering the dust collector and igniting an explosion**.
- Other hazards cited were (but not limited too) combustible dust in electrical outlets.

Can it Happen?

2016 – **Viking Cabinets, Inc. fined $107,000 for hazards including combustible dust** Source: Woodworking Network

- …following an inspection by the state labor department, **found combustible fine wood dust had accumulated on the electrical system and other surfaces in the shop, creating an additional fire hazard.**

Can it Happen?

2016 – NY manufacturer fails to correct comdust hazard, allows recurring fire, explosion…faces $197K in OSHA fines

Source OSHA

Agency inspectors found company failed to address combustible dust hazards involving the dust collection system....also identified failure to: Address combustible dust related fire and explosion hazards for conveyor equipment and an inoperable spark detection/fire suppression system.

- Inspect fire extinguishers annually, and maintain them in fully charged and operable condition.
- Remove accumulations of combustible wood dust and shavings on rafters and other surfaces.
- Remove piles of wood dust and shavings on floors that create fire, slip, trip, and fall hazards.

Can it Happen?

2017 - Unilin wood products explosion kills employee, sends another to ER

Source: Woodworking Network

A big explosion rocked Unilin's wood product plant in Montgomery County, North Carolina

2017 – Two Injured in Silo Explosion, Fire at Mill in Oregon

Source: Powder Bulk Solids

"The explosion was possible by the presence of wood dust, which may have added to the fuel load in the form of finely dispersed combustible particles."

Can it Happen?

China

Three deadly explosions:

- May 2011 - Foxconn Apple factory, aluminum dust
- Dec 2011 - another Apple supplier in Pegatron in Shanghai, aluminum dust
- August 2014 - wheel hub polishing facility in Jiangsu, metal dust, 169 deaths, over 200 injured.

Sept 2015 - China's State Administration of Work Safety issues guidelines to prevent combustible dust explosions.

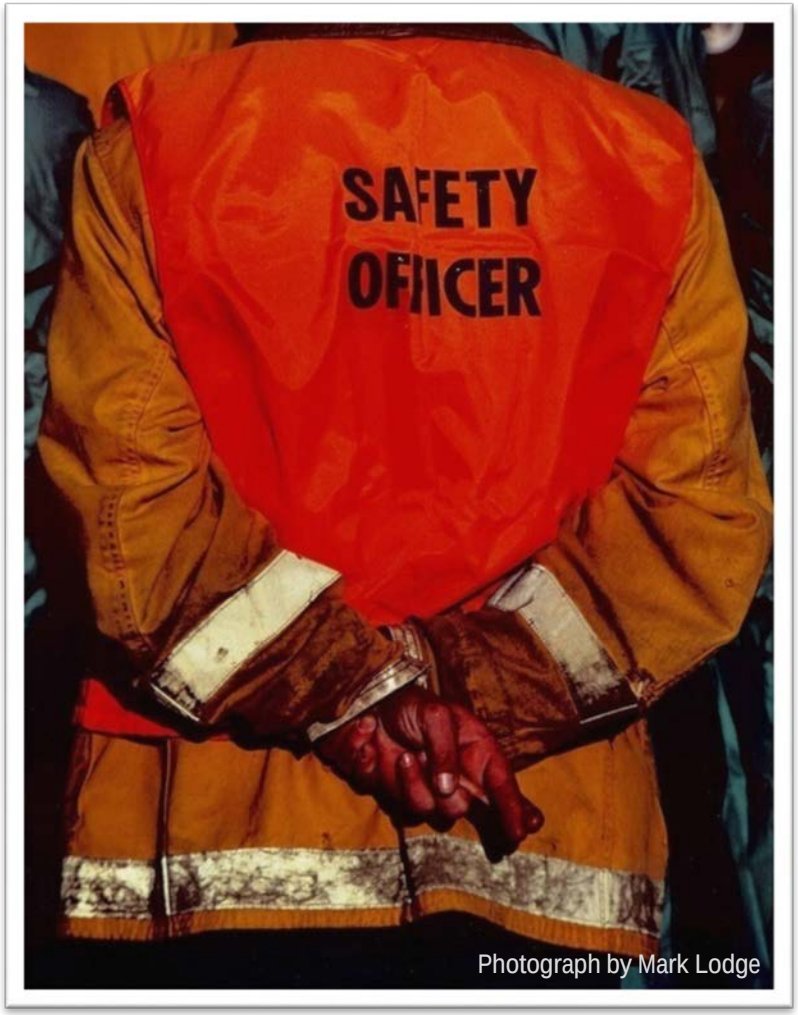
Taiwan

June 2015 - Corn Starch explosion, over 500 injured.

England

July 2015 – Wood Mill, Cheshire UK, 4 deaths, 35 injured

Prevention



Prevention

Use OSHA & NFPA as guidelines

- Hazard Recognition/Assessment
- Building Design & Engineering Controls
- Housekeeping
- Worker Training

Photo: U.S. Chemical Safety Board

Prevention

CCOHS

(Canadian Centre for Occupational Health & Safety)

Clearly defined prevention measures

- Eliminate
- Substitute
- Engineering
- Administration

WORK SAFE BC

WORKING TO MAKE A DIFFERENCE

Photo: Work Safe BC

Prevention

Use OSHA & NFPA as guidelines

- Hazard Recognition/Assessment
- Building Design & Engineering Controls
- Housekeeping
- Worker Training

Photo: U.S. Chemical Safety Board

Prevention

Hazard Recognition/Assessment

Assessment

- Dust Hazards Analysis (DHA) – Example provided in NFPA 652 Standard on Combustible Dusts (Annex B)
- DHA, similar to a PHA (Process Hazard Analysis) is used to indentify hazard at each point along the process and to document how the hazard is managed
- DHA shall be completed with 3-year period from the effective date of this standard (Sept 7, 2015) NFPA 652-2016 7.1.2.2

Insurance Company – Inspection

Check State and Local Codes

AHJ (Authority Having Jurisdiction) – Fire Marshall, Building Inspector.

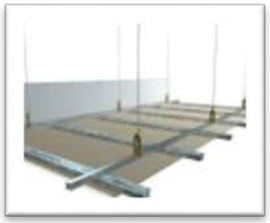
Prevention

Building Design & Engineering Controls

Prevent/Eliminate accumulation of FUGITIVE dust, flat surfaces worst.

- Rectangular HVAC ducting.
- Overhead beams

- Electrical cable trays
- Lighting fixtures



- And “invisible” areas such as THOSE ABOVE suspended ceilings
- Round metal ducting – Better option with less flat surface area.

Prevention

Building Design & Engineering Controls

Equipment

- Abort Gates exhaust hazardous air flow from the ducting. Used in return air systems, Abort Gates safely exhaust hazardous air to the atmosphere, thereby protecting plant and personnel.

Source: GreCon Spark Detection and “Explanatory Materials” Annex A NFPA 664

Prevention

Building Design & Engineering Controls

Equipment

- Explosion Protection VENTING Video

Prevention

Building Design & Engineering Controls

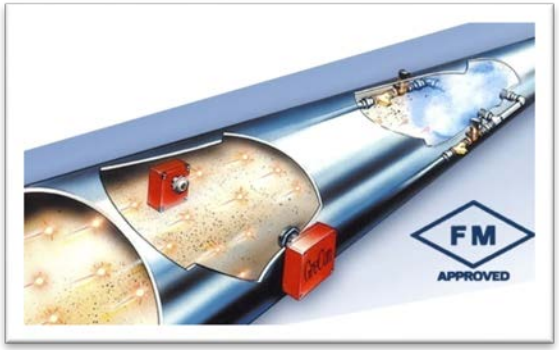
Equipment

- Explosion Protection SUPPRESION Video

Prevention

Building Design & Engineering Controls

Equipment

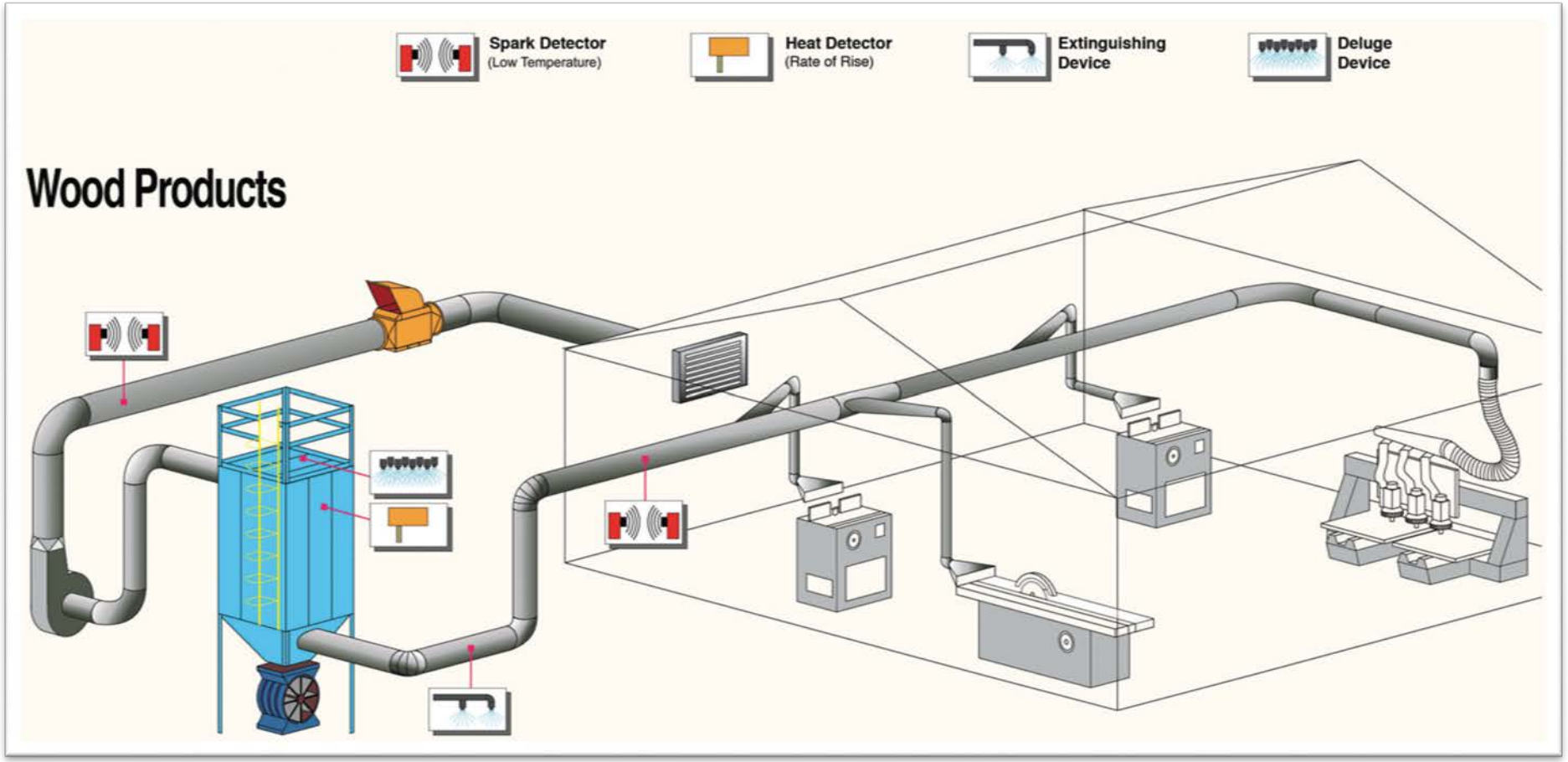


- Spark Detection Information
- Spark detection systems are primarily used as a fire prevention method in dust collectors by detecting and extinguishing sparks and embers.
- A dull tool, a damaged fan bearing, an over heated motor, or a foreign object within the material can be the cause.
- Spark Detection and Extinguishing video simulation for dust collection.

Source: GreCon Spark Detection and “Explanatory Materials” Annex A NFPA 664

Prevention

Building Design & Engineering Controls



For more information go to Informational Primer on Spark Detection and Extinguishing Systems – Annex C NFPA 664

Prevention

Photo: OSHA

Housekeeping – FUGITIVE Dust Control

- **If you can see dust, don't ignore it!**
- Underlying surface colors are NOT readily discernible, warrants immediate cleaning of area. Some guidelines: 1/32, 1/16, thickness of paperclip or dime.
- Clean it up and examine source. Seal openings to prevent the release of dust.
- Inspect workplace – inspect and clean flat surfaces.
- Change/clean filters bags
- Use hanging air filters

Prevention

Housekeeping – FUGITIVE Dust Control

For example per NFPA 664-2012 11.2.1.1

- "Surfaces shall be cleaned in a manner that minimizes the generation of dust clouds. Blowing down with compressed air or even vigorous sweeping shall be permitted only if the following requirements are met:
  - The floor area and equipment shall be vacuumed prior to blowdown.
  - Electrical power and other sources of ignition shall be shut down, removed from the area…per *NFPA 70, National Electrical Code.*

Photo: OSHA

Prevention

Housekeeping – FUGITIVE Dust Control

For example per NFPA 664-2012 11.2.1.1 (con't)

- Only a low gauge pressure 15 PSI steam or compressed air shall be used
- No open flames, sparks from spark-producing equipment, or hot surfaces
- All fire protection equipment shall be in service.
- Explosion proof vacuum or fixed pipe suction system shall be used per NFPA.

Prevention

Worker Training

"Safe work habits are developed and do not occur naturally."
per NFPA 652 (A.8.4.2.1)

- Do the workers know what to do?
- Have they read the operating procedures?
- Do they understand?
- Have they been tested?
- Have you documented worker training?

Photo: OSHA

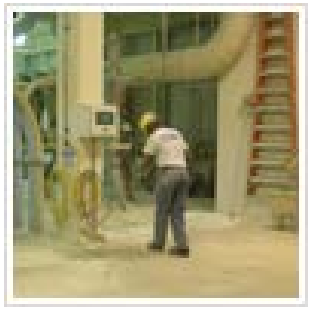
Conclusion – What we discussed:

- What is Combustible Dust?

- Who's in Charge?

- Can it Happen in Your Facility?

- Prevention



Top Three Follow-Ups

1. Act on – Testing
2. Implement – Housekeeping
3. Investigate/Track – OSHA and NFPA 652

Most importantly

be prepared to avoid an INSPECTION

or much worse an EXPLOSION.

Summary

While there is NO specific Combustible Dust REGULATION there is plenty to be concerned about:

Photo: U.S. Chemical Safety Board

OSHA

U.S. Congress

NFPA

AHJ

Insurance Co.

and more.

Resources

FM Global Insurance Company

- Loss Prevention Data Sheet 7-76, Prevention and Mitigation of Combustible Dust Explosions and Fires

NFPA – National Fire Protection Association

- 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
- NFPA 652 Standard on Combustible Dusts

OSHA – Occupational Safety & Health Administration

- Combustible Dust

U.S Chemical Safety Board

- Combustible Dust

My Dust Explosion Research

- My Dust Explosion Research

THANK YOU

Contact Information

Jamison Scott
Executive Vice President
Air Handling Systems

jscott@airhand.com

www.airhand.com

https://www.airhand.com/combustible-dust/