



Training Solutions, Delivered!

COMBUSTIBLE DUST AWARENESS *(Canada)*

**Leader's Guide, Fact Sheet
& Quiz**

Item Number: 4305
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This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation.

PREPARING FOR THE MEETING

Here are a few suggestions for using this program:

- a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.
- b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.
- c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.
- d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes before the quiz itself, which is on the final page.

CONDUCTING THE PRESENTATION

- a) Begin the meeting by welcoming the participants. Introduce yourself and give each person an opportunity to become acquainted if there are new people joining the training session.
- b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.
- c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.
- d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

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FACT SHEET

LENGTH: 9 MINUTES

PROGRAM SYNOPSIS:

If a combustible dust explosion occurs, it often results in severe injuries, burns or deaths. Employees can reduce the potential for dust explosions by being aware of the risks and following safe work practices to mitigate those risks as well as by following the company's emergency contingency plan. That's the purpose of this program--to review the precautions and procedures workers can follow to prevent dust incidents. Topics include the dust explosion pentagon, chain reaction catastrophes, minimizing available dust, engineering controls and awareness of ignition sources.

PROGRAM OBJECTIVES:

After watching the program, the participant should be able to explain the following:

- What the definition of a "combustible dust" is according to the National Fire Prevention Association;
- What the five elements of the dust explosion pentagon are;
- How dust explosions occur;
- What precautions and procedures must be taken to mitigate the risk of a catastrophic dust explosion.

PROGRAM OUTLINE:

DEFINITION OF A COMBUSTIBLE DUST

- Many types of dust can explode and these include not just organic materials like flour, sugar or wood, but also inorganic materials such as some metals, paint, plastics, pharmaceuticals and even some types of textiles. More than 130 products or materials that pose a hazard for dust explosion.
- The fact is many facilities that have processes that produce dust or fine particles may be at risk of a dust explosion, often with catastrophic results, unless precautions are taken and proper procedures are followed.
- The National Fire Prevention Association defines combustible dust as "a finely divided combustible particulate solid that presents a flash fire hazard or explosion hazard when suspended in air or the process specific oxidizing medium over a range of concentrations."

THE DUST EXPLOSION PENTAGON

- First of all, what makes dust such a highly combustible fuel source? You're probably familiar with the ingredients necessary to start a fire. They make up what's commonly referred to as the "fire triangle." They are fuel, oxygen and heat.
- When talking about combustible dust, we add two more ingredients: dispersion and confinement. This is what is referred to as the "dust explosion pentagon." In order for a dust explosion to occur, all five of these ingredients must be in place.
- Dust explosions happen when dust fuel is dispersed into oxygen reaching a sufficient level of concentration in an area of confinement and comes in contact with an ignition source: heat.

HOW DUST EXPLOSIONS OCCUR

- The scary thing about dust is that it doesn't just burn, it explodes. That's because the more surface area a material has exposed to air, the greater its combustibility. Dust has a much greater surface area than the same material would in a compressed, solid state.
- For example, take a sugar cube. It has a surface area of approximately 13 and a half square centimeters, but break it down into individual crystals and the surface area increases over a thousand-fold.
- Now consider the surface area when you crush those crystals into dust. The finer the dust becomes, the greater the likelihood of it exploding; however, that doesn't mean only very fine dust poses a risk.
- A combustible substance only needs to be 420 microns or smaller to be considered an explosion risk. That's about the size of finely ground table salt.
- An animation produced by the US Chemical Safety Board provides a good example of how a dust explosion can occur in an industrial setting.

- Often, the initial dust explosion might be small; as the dust fuel may be limited to the immediate area around the ignition source; however, once the confined dust fuel reaches a certain level of concentration, the explosion expands and travels through vents and duct work, increasing in strength as it feeds off of the dust fuel that has accumulated in those vents.
- These chain reactions can create shock waves, which shake loose dust that may have accumulated on hidden surfaces such as overhead pipes and rafters, creating an explosion that is often far more severe. This amount of additional dust fuel can be many times greater than that which caused the initial blast.

MITIGATING THE RISK OF A CATASTROPHIC DUST EXPLOSION

- So how do we mitigate the risk of a catastrophic dust explosion? Let's go back to the dust explosion pentagon. Remember each one of those five ingredients must be present for a dust explosion to occur.
- For the purpose of this program, we'll focus on the ingredients that we usually have the most control over. These are fuel (dust accumulation), dispersion (ways in which the dust can be mixed into the air) and heat (ignition sources).

Checking For Dust Accumulation

- We need to minimize the fuel, the dust, that is available. Be vigilant throughout your daily routine. Keep your work area clean.
- Frequently inspect areas for dust accumulation. It's often the overlooked areas in a facility where accumulation occurs. When possible, check surfaces that are out of normal lines of sight such as the tops of machinery, or overhead pipes, beams and ductwork.
- If you happen to discover specific areas where dust seems to accumulate, inform your supervisor in case additional preventative measures need to be taken.

Preventing Dust Dispersion

- Engineering control systems such as dust and vapor capture hoods, exhaust vents and other air pollution control systems should be kept clean and free of obstruction.
- The risk of an explosion greatly increases when the dust fuel becomes dispersed in the air. Be sure exhaust and dust collection systems are free of leaks which can re-disperse dust back into the environment.
- Also, check compressed air and vacuum lines for leaks as these can cause localized dispersion.
- Be sure to follow proper procedures for disposing of combustible materials. Never dry sweep or use compressed air to clear away dust.

Reducing The Risk Of Ignition

- Remember when dust fuel is in the air all it takes is one spark. Always be conscious of possible ignition sources such as hot surfaces or sparks from electrical or static discharge.
 - Always clear dust from around electrical outlets and make sure power cables are free of nicks or cuts.
- Know your company's Emergency Contingency Plan, so that in the event of an explosion, you know the correct escape routes, meeting places and other emergency procedures.

CONCLUSION

- Combustible dust is a very real hazard. It's something that can destroy lives. If a dust explosion occurs it very often means severe injuries, burns or death.
- Be aware of the risks, follow safe work practices to mitigate those risks and follow the established emergency contingency plans put in place by your employer.
- If we all follow the precautions and procedures covered in this video as well as specific procedures that may be in place at your facility, we can all go home safely at the end of the day.

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ANSWERS TO THE REVIEW QUIZ

1. b

2. c

3. b

4. d

5. c

6. a

7. a

8. b

9. a

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REVIEW QUIZ

The following questions are provided to determine how well you understand the information presented in this program.

Name _____ Date _____

1. Dusts from metals cannot be combustible.
 - a. True
 - b. False

2. What are the three ingredients necessary to start a fire?
 - a. Heat, Fuel, Dust
 - b. Heat, Dust, Confinement
 - c. Heat, Fuel, Oxygen

3. How fine does dust need to be before it becomes combustible?
 - a. The thickness of a dime
 - b. The size of a grain of table salt
 - c. The width of a human hair

4. Which element is not part of the dust explosion pentagon?
 - a. Heat
 - b. Confinement
 - c. Dispersion
 - d. Separation

5. In a dust explosion, what acts as the fuel source?
 - a. Fire
 - b. Heat
 - c. Dust
 - d. Oxygen

6. Dust explosions happen when dust is mixed with oxygen and comes into contact with _____.
 - a. Heat
 - b. Vapor control hoods
 - c. Duct work

7. What is the term used when dust becomes mixed with oxygen?
 - a. Dispersion
 - b. Depression
 - c. Confinement

8. You should only dry sweep combustible dust if you are wearing a dust mask or respirator.
 - a. True
 - b. False

9. Compressed air should never be used to clear dust away from electrical outlets.
 - a. True
 - b. False