

Combustible dust in the workplace

By Michael Ely

Before you begin

Before leading the discussion, research the following questions.



- Does your facility use or store organic materials (e.g., flour, sugar, wood, coal, cotton, plastic, rubber, etc.); does your facility use or store combustible metals (e.g., aluminum)?
- Has visible dust from any of these materials collected anywhere in the facility?
- Has your organization had a past fire or explosion caused by combustible dust?
- Does your company have a housekeeping program to address how and when to clean up combustible dust?

If you answered yes to the last question, review it before the discussion. If not, prepare one prior to the group discussion.

Introduction

The 2008 explosion and fire at Imperial Sugar Refinery in Port Wentworth, Ga. emphasizes the need for safety procedures when dealing with fine organic dusts (e.g., sugar and flour). In the past 28 years, about 300 dust explosions have killed more than 120 workers and injured several hundred more in sugar plants, food processors, and many industrial and wood manufacturers. In most cases, sound housekeeping practices and good occupational safety and health programs could have prevented these accidents.

Discussion

Your mother really didn't hate you. When she told you to throw flour on a stovetop fire, her goal was to smother the fire with an easily accessible material. However, she might as well have told you to dump gasoline on the fire. That's because fine organic dust particles, just like gas vapors, burn with a great deal of energy. If suspended in the air, organic dust can explode with great force. This is exactly what happened at the Imperial Sugar Refinery on Feb. 7, 2008, where 14 workers died and more than 40 were injured.

Elements of a dust explosion

Elements needed for a fire (the familiar "fire triangle") include:

1. Combustible dust (fuel);
2. Ignition source (heat), and;
3. Oxygen in air (oxidizer).

Additional elements needed for a combustible dust explosion include:

4. Dispersion of dust particles in sufficient quantity and concentration, and;
5. Confinement of the dust cloud.

Dust explosions are almost always a small explosion followed by a larger, more powerful explosion as the dust cloud stirred up by the first, smaller explosion ignites.

What do you need to do?

First, determine if your workplace has the potential for hazards associated with the buildup of organic dust. Material safety data sheets provide good information on the properties of materials that are present in the workplace. However, many do not address the hazards of dust from the material in question. Most of the common organic materials, such as wood, grains, cotton, etc. are easy to recognize. However, plastics, rubber and fine combustible metals such as aluminum and magnesium also present similar hazards. Large particles of these materials are not the concern. Rather, the small, very fine dust particles that are generated by grinding, milling or other mechanical operations do present a danger.

If a potential hazard exists in your facility, company personnel should conduct a full evaluation to determine where dust is generated and what, if any, housekeeping policies and procedures are in place to clean it up. Give special attention to all horizontal surfaces to determine if dust accumulation is present. Engineering controls are the best method of controlling the problem, but even with the best, it may become necessary to clean up dust accumulations.

You should have procedures and proper equipment available to clean up accumulations of combustible dust. Never clean combustible dust accumulations with compressed air. Blow downs only create hazardous clouds of dust. Vacuum, wet mop, shovel or sweep dust carefully into proper containers. This prevents dust particles from being stirred up into the air. During these cleaning operations, remove any ignition sources; this includes the shutdown and lockout of energy sources and equipment.

Summary

Combustible dust is a dangerous, silent killer. It lurks in unseen places such as rafters, the tops of hoods and ductwork, just waiting to become airborne and ignited into an explosive cloud. Make sure your workers are aware of this hazard and use proper procedures and equipment when cleaning dust. Workers should report dust accumulations to management immediately. Yes, your mother did love you. She just didn't understand the hazards of the material she told you to use. Now you understand the hazard and recognize the importance of keeping combustible dust away from all ignition sources.

Group activity

The safety leader should ask the questions below.

- Where do we generate organic or fine metal dust in our facility?
- Where would you expect to find accumulations of dust in our facility?
- Have you seen accumulations of dust?
- How would you go about cleaning it up?
- Where are the tools kept for the cleaning of combustible dust?
- What should you do if you see a combustible dust cloud?

References

Ohio Administrative Code:

http://www2.iccsafe.org/states/ohiofire/OH_Fire/07Fire_PDFs/Rule%2013_Combustible%20Dust-Producing%20Operations.pdf

Combustible Dust in Industry:

Preventing and Mitigating the Effects of Fire and Explosions (OSHA): <http://www.osha.gov/dts/shib/shib073105.html>

Fatality Assessment and Control Evaluation (FACE) Program reports (National Institute for Occupational Safety and Health):

<http://www.cdc.gov/niosh/face/stateface/or/03or021.html>

<http://www.cdc.gov/niosh/fire/reports/face8549.html>

Imperial Sugar Company Dust Explosion and Fire (Chemical Safety Board): http://www.csb.gov/investigations/detail.aspx?SID=6&Type=2&pg=1&F_All=y

Handling Combustible Solids & Particulates (Engineers Collaborative): <http://www.engcollab.com/handling.htm>

Fire Investigation Summary, Grain Elevator Explosion (National Fire Protection Association): <http://www.nfpa.org/assets/files/pdf/Haysville.pdf>

Basics of Dust-Explosion Protection (R.Stahl): http://www.rstahl.com/fileadmin/Dateien/tgus/Documents/ExProtection_Dust-Basics.pdf

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