

## **Combustible Dust – What Does OSHA Look For and How Do I Comply?**

**Jason Reason, CIH, CSP, CHMM  
Compliance Safety & Health Officer  
Indiana Department of Labor, Indiana OSHA  
Indianapolis, IN**

### **Introduction**

The issue of combustible dust and the hazards associated with it has always existed throughout several industries in one form or another. However, it is only recently that the topic of combustible dust has become one of the main concerns and focal points in health and safety. In the past, combustible dust hazards were perceived by most health and safety professionals as low priority and low risk. However, this perception vastly changed after several high-profile combustible dust accidents/fatalities and increased enforcement of combustible dust hazards by the Occupational Health and Safety Administration (OSHA).

Several highly publicized combustible dust accidents and fatalities occurred after 2000 including, but not limited to, the following:

- On January 29, 2003, an explosion and fire destroyed the West Pharmaceutical Services plant in Kinston, North Carolina, causing six deaths, dozens of injuries, and hundreds of job losses. The facility produced rubber stoppers and other products for medical use. The fuel for the explosion was a fine plastic powder, which accumulated above a suspended ceiling over a manufacturing area at the plant and ignited.<sup>1</sup>
- On February 20, 2003, an explosion and fire damaged the CTA Acoustics manufacturing plant in Corbin, Kentucky, fatally injuring seven workers. The facility produced fiberglass insulation for the automotive industry. CSB investigators have found that the explosion was fueled by resin dust accumulated in a production area, likely ignited by flames from a malfunctioning oven. The resin involved was a phenolic binder used in producing fiberglass mats.<sup>2</sup>
- On the evening of October 29, 2003, a series of explosions severely burned two workers, injured a third, and caused property damage to the Hayes Lemmerz manufacturing plant in Huntington, Indiana. One of the severely burned men subsequently died. The Hayes Lemmerz plant manufactures cast aluminum automotive wheels, and the explosions were fueled by accumulated aluminum dust, a flammable byproduct of the wheel production process.<sup>3</sup>

The most publicized and scrutinized combustible dust fatality occurred on February 7, 2008, at the Imperial Sugar Company located in Port Wentworth, Georgia. The vast amounts of sugar dust accumulated throughout the facility caused fires and several violent explosions which ultimately caused fourteen deaths and thirty-eight injuries. The explosion that occurred at Imperial Sugar caused all health and safety professionals and industries to reexamine the potential hazards caused by combustible dusts.

On October 18, 2007, OSHA initiated the Combustible Dust National Emphasis Program (CPL 03-00-006). On March 11, 2008, OSHA reissued the Combustible Dust National Emphasis Program (CPL 03-00-008) to increase its enforcement activities and to focus on specific industry groups that have experienced either frequent combustible dust incidents or combustible dust incidents with catastrophic consequences<sup>4</sup>. Since its inception, OSHA's Combustible Dust National Emphasis Program (NEP) has caused the number and severity of combustible dust citations to vastly increase. The increased examination and enforcement of combustible dust hazards by OSHA has caught most employers and industries off-guard. The vast majority of employers want to eliminate all potential combustible dust hazards, but they do not know where to start or what even constitutes a hazard.

This paper will focus on what OSHA Compliance Officers look for on a typical combustible dust inspection. This paper will also examine the most common types of combustible dust hazards found during OSHA inspections.

### **What Is A Combustible Dust?**

Currently, there is no one agreed-upon definition of a combustible dust. Both OSHA and the National Fire Protection Association (NFPA) defines a combustible dust as a combustible particulate solid that presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations, regardless of particle size or shape (Section 3.3.4 of NFPA 654-2006). Although NFPA's *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids* (NFPA 654) defines a combustible dust, several other NFPA standards also define a combustible dust. At this time, the definition of a combustible dust may vary depending on which NFPA standard the user is referencing.

Combustible dusts include a variety of dusts and powders, and the majority of these dusts and powders are used and/or generated frequently in many diverse industries. Examples of dusts and/or powders that are typically considered combustible dusts are:

- Organic Dusts (Sugar, Flour, Paper, etc.)
- Wood Dusts (All Varieties, Including Sawdust)
- Metal Dusts (Aluminum, Magnesium, Titanium, etc.)
- Plastic Dusts (Most Varieties)
- Chemical Dusts (Pharmaceutical, Powder Coating, etc.)

- Carbon Dusts (Coal)

### **Standards Referenced or Used During an Inspection**

During an OSHA combustible-dust inspection, the Compliance Officer must know and use several health and safety standards. OSHA currently does not have a specific standard that specifically addresses combustible dust hazards. However, OSHA can address and cite combustible dust hazards (fire, deflagration, explosion, etc.) under the General Duty Clause. There are also over twenty OSHA standards that directly or indirectly address combustible dust hazards. Currently, the most commonly cited OSHA standard for combustible dust hazards is the Hazard Communication (HazCom) Standard (29 CFR 1910.1200).

Although OSHA has not developed a combustible dust standard, several other associations and organizations have developed standards or practices that specifically address combustible dust hazards. Currently, there are over fifteen consensus standards that directly address combustible dust hazards. Most of these combustible dust consensus standards are developed by NFPA. The four most commonly used NFPA combustible dust standards are as follows:

- *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids* (NFPA 654-2006)
- *Standard for Combustible Metals, Metal Powders and Metal Dusts* (NFPA 484-2012)
- *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities* (NFPA 61-2008)
- *Standard for the Prevention of Fires and Dust Explosions in the Wood Processing and Woodworking Facilities* (NFPA 664-2012)

Although OSHA cannot enforce consensus standards, OSHA Compliance Officers can rely upon NFPA and other consensus standards for evidence of recognition of the hazard, as well as for evidence of feasible means of abatement.

### **Deflagration/Explosion Protection**

The most common hazard found during OSHA combustible-dust inspections is dust collectors and other process equipment not equipped with explosion protection. Due to their construction and operation, dust collectors possess all of the necessary elements for a dust explosion to occur. Thus, unless otherwise noted in the specific consensus standard, dust collectors that collect combustible dust(s) are required to be protected from explosion. The most common forms of explosion protection are deflagration (explosion) venting and deflagration suppression systems. Other forms of explosion protection include, but are not limited to, oxidant concentration reduction (i.e. inerting), deflagration pressure containment (i.e. designed to withstand the force of the deflagration without rupture) and dilution with a non-combustible dust (limestone, sand, etc.)

### **Improper Deflagration Venting**

Another common hazard found during OSHA combustible-dust inspections is improperly installed or maintained deflagration venting and/or deflagration suppression systems. Although the dust collector or process machinery may be equipped with explosion protection, the explosion

protection may create an additional hazard due to the way in which it was installed. For example, several employers have installed deflagration venting on dust collectors located outside of the facility. However, some of these deflagration vents point directly towards the emergency exit doors and/or routes. Thus, employees using these emergency exit doors and routes would be exposed to the fireball emitted from the dust collector during a vented deflagration.

### **Housekeeping**

Most employers and health and safety professionals now know that if you have more than 1/32 of an inch of dust, then you need to clean the floor or surface immediately. However, this threshold quantity for housekeeping has recently changed due to the passage of the Tentative Interim Agreement (TIA) for NFPA 654-2006. Per the TIA for NFPA 654-2006, the employer (and Compliance Officer) must now calculate and determine if a deflagration hazard exists in the room or area.

Several employers and health and safety professionals think that keeping all of the areas and surfaces clean will prevent a deflagration from occurring. However, good housekeeping alone will not prevent a fire or explosion because improper housekeeping (i.e. large dust accumulations) are a secondary explosion hazard. The primary explosion will occur inside of dust collector or process equipment and will not be influenced by large dust accumulations. This initial (primary) explosion in processing equipment or in an area where fugitive dust has accumulated, may shake loose more accumulated dust, or damage a containment system (such as a duct, vessel, or collector). If ignited, the additional dust dispersed into the air may cause one or more secondary explosions. Thus, the best housekeeping program alone will not prevent a primary explosion from occurring inside of process equipment or throughout the facility.

### **Other General Items Cited During OSHA Combustible Dust Inspections**

In addition to the hazards listed previously, other hazards commonly found during OSHA combustible dust inspections include the following:

- Ventilation – Improperly placed make-up air vents and ineffective maintenance of ventilation system (blanked off ventilation ducts, improper branch entries, inadequate transport velocity, etc.)
- Sources of Ignition – No hot-work permit system and improper electrical equipment used in areas where combustible dusts are used or generated. Smoking and other sources of ignition (heaters, open flames, etc.) permitted in areas where combustible dusts are used or generated
- Use of compressed air to clean or blow off surfaces with settled fugitive combustible dust emissions without controlling sources of ignition
- Ineffective HazCom Training for Employees – Employees who work with and/or around areas where combustible dust(s) are used or generated were not provided effective training on the physical hazards of the combustible dust
- Material Safety Data Sheets (MSDSs) – MSDSs did not specifically list all of the physical hazards associated with the combustible dust(s)

- Improperly rated forklifts used in areas where combustible dust is generated and/or settled
- Fire extinguishers missing or blocked with materials making them inaccessible
- Flame-Resistant Clothing (FRC) not required to be worn in areas where large amounts of combustible dusts are generated and a flash-fire hazard potentially exists
- Non-approved portable vacuum cleaners used to collect combustible dusts.

## Bibliography

1. Chemical Safety Board (CSB). West Pharmaceutical Services Dust Explosion and Fire (retrieved February 23, 2012)  
([http://www.csb.gov/investigations/detail.aspx?SID=36&Type=2&pg=1&F\\_AccidentTypeId=1](http://www.csb.gov/investigations/detail.aspx?SID=36&Type=2&pg=1&F_AccidentTypeId=1))
2. Chemical Safety Board (CSB). CTA Acoustics Dust Explosion and Fire (retrieved February 23, 2012)  
([http://www.csb.gov/investigations/detail.aspx?SID=35&Type=2&pg=1&F\\_AccidentTypeId=1](http://www.csb.gov/investigations/detail.aspx?SID=35&Type=2&pg=1&F_AccidentTypeId=1))
3. Chemical Safety Board (CSB). Hayes Lemmerz Dust Explosion and Fire. (retrieved February 23, 2012)  
([http://www.csb.gov/investigations/detail.aspx?SID=33&Type=2&pg=1&F\\_AccidentTypeId=1](http://www.csb.gov/investigations/detail.aspx?SID=33&Type=2&pg=1&F_AccidentTypeId=1))
4. Occupational Safety and Health Administration (OSHA). Combustible Dust National Emphasis Program (CPL 03-00-008) (retrieved February 23, 2012)  
([http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=3830](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=3830))