# Are You Ready?

**Preventive measures are the best defense against many dangers in a processing plant, including dust explosions.**

By Gary Q. Johnson

Seemingly innocuous dusts (i.e. household sugar and the disaster at the Imperial Sugar Co. in Port Wentworth, GA earlier this year) can explode, causing fatalities and widespread devastation. Whether your facility processes powders or performs operations on solid materials that produce combustible dusts, you bear the risk of a dust explosion.

The three main reasons to take a new look at combustible dust hazards are simple and obvious. It really comes down to protecting your employees, protecting your business, and having risk mitigation in place to avoid regulatory action from OSHA and state agencies. This article provides an overview of combustible dust hazards and the OSHA Combustible Dust National Emphasis Program (CDNEP) inspection.

In October 2007, OSHA began CDNEP inspections at a rate of one per OSHA area. As a result of the Imperial Sugar explosion, it reissued the CDNEP in March 2008 with an increase in the number of required inspections to four per OSHA area per year, using a risk-based approach for industries with a history of dust explosions. To date, federal OSHA has issued more than 100 citations to sites for not adequately protecting against this hazard.

Many people have an appreciation for flammable liquid hazards having seen liquids like gasoline or alcohol burn. Dust explosions, however, are not part of “conventional wisdom” as only a small number of people have experienced them. An analysis by the U.S. Chemical Safety Board found that they are not well understood, even by insurance companies, environmental health and safety professionals, or government regulatory agency personnel—hence the OSHA CDNEP to raise awareness so that combustible dust hazards can be addressed with appropriate risk-mitigation strategies.

#### Combustible Dust 101

Combustible dust explosions occur when two additional factors are combined with the fire triangle, which consists of a heat or ignition source, fuel and an oxidizer. The other factors that figure into the equation would be dispersion of the dust in a cloud at a high enough concentration, and confinement of the dust cloud in equipment or buildings. This is represented in the Dust Explosion Pentagon shown above.Many natural and synthetic dusts, particles, flakes or fibers, along with some metal dusts, such as aluminum and magnesium, have combustible dust hazard properties. Knowing whether or not your dusts are combustible requires laboratory

testing. If the dust is easily ignited by static electricity, then further testing would be needed to better characterize the risk.

Below are some possible risk-mitigation strategies that can be applied in accordance with the hazard analysis of your specific process. OSHA views these industry consensus standards as feasible methods to abate combustible dust risks:

- Ignition prevention through static electrical grounding and bonding, the proper use of conductive construction materials and the implementation of Class II electrical equipment.
- Explosion protection via explosion vent membranes or doors, flame-arresting and particulate retention vents, as well as the evaluation of the placement of equipment outdoors vs. indoors.
- Explosion prevention by reducing the oxygen content of interior spaces with inert gases like nitrogen and curtailing combustible particulate concentration in an area.
- Isolating the explosion from connected equipment with fast-acting mechanical valves, actuated float valves, actuated pinch valves, flame front diverters, passive float valves and material chokes, such as rotary valves or flame arresters.

#### OSHA Combustible Dust Inspections

The key objectives of CDNEP inspections are to determine if there arecombustible dust hazards in the workplace, and if they are present, how to mitigate them using recognized industry standards.

Here is a list of possible questions that can help you prepare for a CDNEP inspection:

- Is there a combustible dust hazard? Plant history of fire? Dust accumulations greater than 1/32 inches on the floor or overhead, covering more than 5 percent of the building area or 1,000 square feet?
- Are measures in place to abate the combustible dust hazard? Does equipment meet industry consensus standards? Has explosion venting, prevention and/or isolation per NFPA standards been put in place?
- Does process equipment (i.e., mixers, dryers, pneumatic conveying, bucket elevators, etc.) contain clouds of dust? Is dust collection, ducting or exhaust recirculation equipment in place to adequately control this dust?
- Are there any sources of ignition (i.e., welding, fork trucks, static electricity producers, etc.) in the combustible dust area?
- Are warning signs posted referencing combustible dust? Are employees trained on combustible dust issues?

The best practice for risk management is knowledge of the material hazards and the locations where these hazards pose the highest risk, then applying risk-

mitigation strategies to protect employees and the business. If your operation produces dusts, it would be prudent to conduct your own CDNEP inspection and develop an action plan around it. That way, if OSHA visits, you will have already moved forward to solve the combustible dust problems identified, instead of having OSHA be the first to notify you of such issues.

Gary Q. Johnson is a professional chemical engineer and consultant who specializes in the development of containment and industrial ventilation, process safety, and procedural solutions for workplace exposure. For more information, contact Johnson at gary@workexposoln.com [1] or visit www.workexposoln.com [2].

**Paying The Price**

The following are possible citations that can result from an OSHA combustible dust inspection:

- Ventilation violations based on abrasive blasting, grinding, polishing or buffing operations, as well as spray finishing without flammable solvents.
- Housekeeping standard violations in process or storage areas.
- OSHA Law Section 5(a)(1) general-duty clause violations due to combustible dust within dust collection systems or process equipment, or accumulations within a building if a condition or activity in the employer's workplace presents a hazard to employees (i.e., dust accumulations of greater than 1/32 inches or dust explosion hazards within equipment); the employer or employer's industry recognizes the hazard, even if site personnel do not; the identified hazard is likely to cause death or serious physical harm; the hazard can feasibly be eliminated or materially reduced by applying NFPA standards; or the equivalent.
- Personal protective equipment citations when protective equipment, such as flame-resistant clothing, is not worn in areas with the potential for flash fires.
- Electrical violations, which can be given if Class II electrical equipment is not present, but required in combustible dust areas with electrical components, such as fork trucks or welding equipment.
- A lack of warning signs in the presence of equipment or the entrance to places where explosive atmospheres may occur.
- Egress violations related to providing a means of escaping combustible dust areas.
- Fire protection violations, which can be given if fire extinguishers are not provided in such areas.

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