

Explosion Hazards of Combustible Dusts

By: *Michelle M. Major, MS*

Combustible dust explosions and fires have resulted in occupational injuries, fatalities and significant property damage. In their combustible dust hazard survey (1980-2005), the U.S. Chemical Safety and Hazard Investigation Board (CSB) identified 281 combustible dust incidents, including the four tragic events described below:

Malden Mills, Methuen MA (Polartek fleece fabric production)

Event: December 11, 1995

Consequences: Facility destroyed; 37 injuries

Combustible Material: Nylon flock fibers

Investigative Conclusions: The originating event was reportedly a dust explosion involving nylon fibers. Previous events at this company indicated that nylon fibers were ignited by static electricity.

West Pharmaceutical Services, Kingston, NC (Rubber syringe and other pharmaceutical device production)

Event: January 29, 2003

Consequences: Facility destroyed; 6 fatalities

Combustible Material: Polyethylene powder dust

Investigative Conclusions: The CSB identified that the electrical equipment above the suspended ceiling in the Rubber Compounding area was not rated for use around combustible dust. Reference the National Electric Code (NEC). This event was a secondary dust explosion.

CTA Acoustics, Inc., Corbin, KY (Acoustic insulation production for automobiles)

Event: February 20, 2003

Consequences: Facility destroyed; 7 fatalities and 37 injuries

Combustible Material: Phenolic resin powder dust

Investigative Conclusions: The safety data sheet (SDS) for the resin dust did not adequately communicate that the material posed a dust explosion hazard. The CSB indicated that the explosion could have been prevented or mini-

mized if the National Fire Protection Association (NFPA) Standards for housekeeping and/or fire/explosion barriers had been followed.

Hayes Lemmerz International, Huntington, IN (Manufacturer of cast aluminum & aluminum alloy automotive wheels)

Event: October 29, 2003

Consequences: 1 fatality, several injuries

Combustible Material: Aluminum dust

Investigative Conclusions: The CSB determined that the explosion could have been prevented if the company had adhered to the NFPA Standard for combustible metals (NFPA 484). This event was a dust explosion spread through pipes or duct vents.

After the CSB issued its report, there have been additional tragic incidents. For example, 14 workers were killed in a 2008 sugar dust explosion in Georgia (Imperial Sugar), and 3 workers were killed in a 2010 titanium dust explosion in West Virginia (AL Solutions).



This photo shows the firefighting efforts following the nylon fiber explosion at Malden Mills (Methuen, Massachusetts, December 11, 1995)

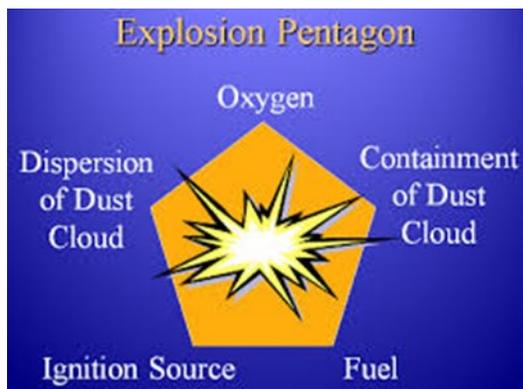
(Cont. on page 2)

What is Combustible Dust?

A combustible dust is any combustible material that will burn or explode when it is finely divided and dispersed in a sufficient concentration. Examples include manufactured powders such as cornstarch and aluminum powder coatings. Other combustible dusts are generated by handling and processing (i.e. polishing, grinding, shaping) of combustible materials such as wood and plastic pellets. Not all particles burn, however, because not all particles are combustible. For example, salt and baking soda will not burn, because these particles are not combustible.

What elements comprise a Combustible Dust Explosion?

The elements needed for a combustible dust explosion include a combustible dust (the fuel), an ignition source (heat); oxygen in the air (oxidizer); dispersion of dust particles in sufficient quantity and concentration; and, confinement of the dust cloud.



What initial steps should employers take to identify Combustible Dust Hazards?

- Review safety data sheets (SDSs). Manufacturers are required, as part of the **hazard determination process**, to assess all physical and health hazards under normal conditions of use as well as in a foreseeable emergency.
- Identify and evaluate processes that use combustible materials and/or may generate combustible materials through handling/processing.
- Insure that you have a good housekeeping program in affected areas and/or processes. In particular, attention should be given to the accumulation of settled dust on horizontal surfaces. The NFPA guidance

measure for a **significant explosion hazard** is when **1/32 of an inch of dust has accumulated in over 5% of a room's surface area.**

- Identify electrical equipment as well as firefighting equipment in affected areas and/or processes.
- Consult applicable NFPA documents for guidance in eliminating and/or minimizing combustible dust fire and explosion hazards, especially with regard to the design of dust collection systems.
- Seek expertise from combustible dust specialists as necessary.

CONN-OSHA offers a free consultation program which is available to employers, at their request. Consultants can help them determine if they are compliant with the standards applicable to their workplace. For more information about the consultation program, visit our website at www.ctdol.state.ct.us/osha/consulti.htm or call our office at (860) 263-6900.

What did the CSB Combustible Dust Hazard Survey reveal?

The U.S. Chemical Safety and Hazard Investigation Board (CSB) conducted a combustible dust hazard survey over a 25-year period (1980-2005) and identified 281 combustible dust incidents. The incidents occurred in 44 states across many different industries and involved a wide variety of materials. In total, 718 employees sustained injuries; 119 employees were fatally injured; and extensive damage to the affected industrial facilities resulted from the events.

The material causes of the combustible dust incidents were wood (20%), food-related (20%), metals (20%), and plastics (14%). Dust collectors were the type of equipment most often found to be involved in the incidents.

Key issues identified by the CSB survey were that appropriate engineering controls had not been implemented, and that inadequate maintenance and housekeeping were prevalent. Overall, it was the secondary dust explosions from inadequate housekeeping and excessive dust accumulations that caused most of the damage and casualties.

Connecticut Department of Labor - OSHA
38 Wolcott Hill Road
Wethersfield, CT 06109

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Final Rule to Improve Tracking of Workplace Injuries and Illnesses Fact Sheet

Each year, millions of workers suffer serious injuries and illnesses on the job. Under the Federal *Occupational Safety and Health Act*, employers must provide their workers with worksites free of recognized serious hazards. In order to help prevent work-related injuries and illnesses, the Occupational Safety and Health Administration (OSHA) has for decades required employers to keep track of their workers' injuries and illnesses by recording them in what is often called an "OSHA log."

Under a final rule that becomes effective January 1, 2017, OSHA will revise its requirements for recording and submitting records of workplace injuries and illnesses to require that some of this recorded information be submitted to OSHA electronically for posting to the OSHA website.

We are taking information that employers are already required to collect and are using this data to help keep workers safer and make employers, the public, and the government better informed about workplace hazards. Releasing the data in standard, open formats will:

- Encourage employers to increase their efforts to prevent worker injuries and illnesses, and, compelled by their competitive spirit, to race to the top in terms of worker safety.
- Enable researchers to examine these data in innovative ways that may help employers make their workplaces safer and healthier and may also help to identify new workplace safety hazards before they become widespread.

In addition, the final rule includes provisions that encourage workers to report work-related injuries or illnesses to their employers and prohibit employers from retaliating against workers for making those reports.

OSHA expects this new rule will help improve workplace safety through expanded access to timely, establishment-specific injury and illness information for OSHA, employers, employees, employee representatives, potential employees, customers, potential customers, and public health researchers.

The rule will also provide OSHA with data to assist the agency in improving allocation of compliance assistance — help OSHA provide to employers who want to improve their safety standards — and enforcement resources, expanding the Agency's ability to identify, target and remove safety and health hazards, thereby preventing workplace injuries, illnesses and deaths. It will also enable OSHA to conduct more rigorous evaluations of the impact of government injury prevention activities.

In addition, behavioral science suggests that public disclosure of the data will "nudge" employers to reduce work-related injuries and illnesses in order to demonstrate to investors, job seekers, customers, and the broader public that their workplaces provide safe and healthy work environments for their employees. Currently, employers cannot compare their injury experience with other businesses in their industry; they can only compare their experience with their industry as a whole. Access to establishment-specific data will enable employers to benchmark their safety and

health performance against industry leaders, encouraging them to improve their safety programs.

Finally, public access to very large sets of workplace injury and illness data will provide public health researchers with unprecedented opportunities to advance the fields of injury and illness causation and prevention research.

Background

In 2013, OSHA issued a proposed rule to improve tracking of workplace injuries and illnesses through the electronic collection of establishment-specific injury and illness data to which OSHA does not have direct access. The agency held a public meeting in January 2014 and received comments on the proposal. After considering the public comments, OSHA is now issuing a final rule that requires certain employers to electronically submit injury and illness data.

Electronic Submission Requirements

The final rule requires certain employers to electronically submit the injury and illness information they are already required to keep under existing OSHA regulations.

The requirement applies to the following:

- Establishments with 250 or more employees that are currently required to keep OSHA injury and illness records must electronically submit information from OSHA Forms 300 — *Log of Work-Related Injuries and Illnesses*, 300A — *Summary of Work-Related Injuries and Illnesses*, and 301 — *Injury and Illness Incident Report*.
- Establishments with 20-249 employees that are classified in certain industries with historically high rates of occupational injuries and illnesses must electronically submit information from OSHA Form 300A.

The electronic submission requirements do not change an employer's obligation to complete and retain injury and illness records.

Data submission from OSHA Forms 300 — *Log of Work-Related Injuries and Illnesses*, 300A — *Summary of Work-Related Injuries and Illnesses*, and 301 — *Injury and Illness Incident Report* for these establishments will be phased in as follows:

| Submission year | Establishments with 250 or more employees | Establishments with 20-249 employees | Submission deadline |
|-----------------|---|--------------------------------------|---------------------|
| 2017 | Form 300A | Form 300A | July 1, 2017 |
| 2018 | Forms 300A, 300, 301 | Form 300A | July 1, 2018 |

For additional information on this topic go to:
<https://www.osha.gov/recordkeeping/finalrule/index.html>

Fatality & Casualty Reporting

State & Town: CONN-OSHA (860) 263-6946 (local) or 1-866-241-4060 (toll-free)
Private Employers: Report to Federal OSHA at 1-800-321-OSHA(6742)

Hazard Corner.....

Jan 5, 2012

CSB Releases Final Investigation Report on Three Accidents at an Iron Powder Facility in Tennessee

January 5, 2011, Nashville, TN – The U.S. Chemical Safety Board today released its final report on three accidents that occurred in 2011 at a powdered metals plant in Tennessee. Flash fires and an explosion killed a total of five workers and injured three others. In the first incident fine particles of iron dust ignited while a maintenance mechanic and an electrician were troubleshooting a problem with a bucket elevator. Both employees suffered burns and later died from their injuries. Two months later another employee was burned in a similar flash fire. In May a hydrogen explosion erupted in the plant, after the gas began leaking from a corroded furnace pipe. The blast shook loose iron dust accumulations from the upper reaches of the building, which ignited and rained down on workers. The explosion and ensuing fire killed three workers and injured two others.

The CSB report notes that engineering controls, such as enclosing conveyors and installing properly designed dust collection equipment are the best ways to prevent dust accumulations. CSB investigators found that the plant's

powder handling equipment was not adequately sealed.

The CSB case study also noted that NFPA 484, the Standard for Combustible Metals, recommends that floors, elevated platforms, and gratings be designed to prevent dust accumulations and to facilitate cleaning. The NFPA standard also requires that all machines that release combustible dust be connected to a dust collection system.



To view the full article, go to: <http://www.csb.gov/csb-releases-final-investigation-report-on-three-accidents-at-the-hoeganaes-iron-powder-facility-in-gallatin-tennessee/>

CONN-OSHA~ Training Update...

Construction Site Safety *March 8, 2017 from 9:00 a.m. to noon* Construction managers, first line supervisors, and construction employees will be provided with an overview of four areas of concern on the construction site: fall protection, scaffolding and ladders, electrical hazards and trenching safety.

Work Zone Safety *April 5, 2017, from 10:00 a.m. to noon* Basic guidelines for work zone traffic control and the requirements of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) with particular emphasis on short term work sites on roads and streets in rural and small urban areas will be presented.

Lockout/Tagout *April 12, 2017 from 10:00 a.m. to noon* This 2-hour session will discuss comprehensive energy control protocols designed to protect workers performing servicing and other tasks while achieving maintenance, quality control and production goals.

OSHA Recordkeeping *April 19, 2017 from 9:00 a.m. to noon* This interactive session will discuss the rules and ensure confidence that you have properly recorded and reported occupational injuries and illnesses, including how to fill out the OSHA 300 Log of Work-Related Injuries and Illnesses accurately and correctly. The new electronic reporting requirements will also be discussed.

Hazard Communication *May 10, 2017 from 10:00 a.m. to noon* At this workshop the Hazard Communication Standard (HCS) 29 CFR 1910.1200 will be reviewed and the topics of hazard classification, the pictograms and safety data sheets will be discussed.

Breakfast Roundtable This discussion group meets the third Tuesday of every month from 8:15 am to 9:45 am. Pre-registration is required. Visit our web page for more information: <http://www.ctdol.state.ct.us/osha/Breakfast/index.htm> To be placed on the e-mail distribution list, contact John Able at John.able@ct.gov

Classes are free and are held at 200 Folly Brook Boulevard, Wethersfield, CT in Conference Room A/B (unless otherwise noted). To register, contact Catherine Zinsser at catherine.zinsser@ct.gov Pre-registration is required. A Photo I.D. is also required to allow entry into a public building. For more training information, visit the CONN-OSHA web site www.ConnOsha.com