

Combustible
Dust:



Regulatory and Legal Challenges

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Overview

- Combustible dust is defined as a solid material composed of distinct particles or pieces, regardless of size, shape, or chemical composition, which presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations. Combustible dusts are often either organic or metal dusts that are finely ground into very small particles, fibers, fines, chips, chunks, flakes, or a small mixture of these.
- Recent high-profile combustible dust incidents have drawn attention to this long-recognized hazard
- OSHA regulations were deemed insufficient because they fail to regulate dusts other than grain adequately
- Congress seeks to force adoption of fast-track regulation to govern all combustible dusts



Overview

- U.S. Chemical Safety Board (CSB) has identified 281 combustible dust fires and explosions since 1980 – causing nearly 1,000 fatal or serious injuries.
 - Incidents occurred in 44 states, mostly in food processing facilities or in those involving paper or wood dust.
- More than 1/32 of an inch of dust over 5% of a room's surface area presents significant explosion hazard, according to NFPA – this is part of OSHA inspection procedures now.
- Types of explosions: Primary (when dust suspension is ignited and explodes); and Secondary (when dust accumulations on floor and surfaces ignites from primary explosion).
 - Secondary often more deadly and damaging!
- Chain reactions involving dust suspended in air are common.
- Combustible dust is generated from various industrial/agricultural activities involving:
 - Flour, sugar, food-related dusts
 - Wood
 - Coal
 - Paper
 - Plastic
 - Metals



Overview – Fire/Explosion Pentagon

- Elements of dust explosion
 - Combustible dust (fuel)
 - Ignition source (heat)
 - Oxygen in air (oxidizer)
 - Dispersion of dust particles in sufficient quantity and concentration, and
 - Confinement of the dust cloud.
- Any element that can burn in air can be combustible in finely divided form
- Industrial settings may contain high-energy ignition sources – ASTM test methods may be of value



Combustible Dust Analysis Basics

- A primary step to determine if combustible dust is a potential hazard at a worksite is to conduct a hazard analysis. This analysis involves assessment of:
 - All materials handled;
 - All operations conducted, including byproducts;
 - All spaces (including hidden ones); and
 - All potential ignition sources.



OSHA Dust Standards

- 29 CFR 1910.272 – Grain handling facilities (1987 standard)
 - Appendix A(7) addresses dust accumulations and emissions
- Section 5(a)(1) – General Duty Clause: Employer must “furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm” Feasible means must exist to abate the hazard.



Relevant OSHA Standards

- §1910.22 Housekeeping;
- §1910.38 Emergency Action Plans
- §1910.94 Ventilation Requirements (covers operations such as abrasives, blasting, grinding, or buffing which involve dusts, including combustible dusts);
- §1910.146 Permit-required Confined Spaces
- §1910.157 Portable Fire Extinguishers
- §1910.165 Employee Alarm Systems
- §1910.176 Material Handling
- §1910.178 Powered Industrial Trucks
- §1910.269 Electrical Power Generation
- §1910.272 Grain Handling Facilities
- §1910.307 Hazardous Locations; and
- §1910.1200 Hazard Communication.



OSHA Activities on Combustible Dust

- In wake of Imperial Sugar tragedy, OSHA has sent advisories to 30,000+ companies concerning combustible dusts hazards
- OSHA CPL 03-00-008 (3/11/08): Provides policies and procedures for inspecting workplaces that create or handle combustible dusts that could cause deflagration, fire or explosion.
 - But only 50 out of more than 1,000 federal inspectors have combustible dust training ... to cover 30,000 at-risk worksites!
 - In 2008, OSHA chief told “60 Minutes” OSHA could inspect 300/yr.
 - Not clear if state-plan-states will also implement an SEP
 - SEP does not include manufacturing facilities that are under the PSM standard, 1910.119, nor are explosives and pyrotechnics manufacturing covered
- OSHA SHIB 07-31-2005: Preventing and Mitigating Effects of Fires and Explosions (Combustible Dust in Industry) – not enforceable but SHIB highlights hazards, training, work practices and guidelines



Petition for Emergency Standard

- February 7, 2008: United Food & Commercial Workers Int'l and Teamsters unions called on OSHA to issue emergency standard
- Petition filed with OSHA asking them to follow CSB recommendations in developing permanent standard to control combustible dust hazards in general industry
 - Union also requested Special Emphasis Program for industries where combustible dust hazards exist



OSHA Rulemaking

- In July 2009, OSHA issued new Hazard Communication guidance on Combustible Dust – see <http://www.osha.gov/Publications/3371combustible-dust.html>
- OSHA released Advanced Notice of Proposed Rulemaking to evaluate possible regulatory methods (10/21/09 Fed Reg; stakeholder meeting set for 12/14/09 in DC)
- Agency requests data and comments on issues related to combustible dust such as:
 - hazard recognition,
 - Hazard assessment,
 - Communication and training;
 - Use of consensus standards;
 - Small business impact;
 - Engineering and administrative controls.



Combustible Dust & HazCom

The following MSDS requirements are applicable to combustible dust hazards:

- The chemical and common name(s) of the hazardous chemical or the chemical and common names of all ingredients which have been determined to present a physical hazard when present in a mixture
- Physical and chemical characteristics of the hazardous chemical (for example, vapor pressure or flash point) including the potential for fire, explosion, and reactivity (if known, Kst, MIE, MEC and particle size are combustible dust characteristics)
- Any generally applicable precautions for safe handling and use, which are known to the chemical manufacturer, importer or employer preparing the MSDS, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for cleanup of spills and leaks, and
- Any generally applicable control measures, which are known to the chemical manufacturer, importer or employer preparing the MSDS, such as appropriate engineering controls, work practices, or personal protective equipment



Chemical Safety Board Input

- ❑ Following three deadly explosions, in 2006, Chemical Safety Board issued report recommending that OSHA issue a rule
- ❑ CSB found fire officials rarely inspect industrial facilities to enforce fire codes
- ❑ CSB found MSDSs for combustible powders frequently (41% of time) fail to provide warnings that the powders can explode and fail to provide appropriate NFPA references.
- ❑ CSB recommended that OSHA expand dust warnings under HazCom and train inspectors to recognize combustible dust hazards and to implement Special Emphasis Program



CSB Findings

- ❑ NFPA standards to prevent and mitigate combustible dust explosions are widely recognized by experts and effective and, if followed would have prevented or reduced impact of the explosions studied by CSB.
- ❑ OSHA enforcement is reactive – after accidents – using either GDC or standards only tangentially related to combustible dust
- ❑ OSHA’s grain facilities standard has been effective in reducing number and severity of grain dust explosions over past 20 years and is example for addressing problem in other industries
- ❑ ANSI should amend Z400.2 to provide specific guidance on preparing MSDSs for combustible dusts



Congressional Action

- The latest version of the legislation is H.R. 849, introduced by Rep. George Miller (D-CA) on February 4, 2009.
- The *Worker Protection Against Combustible Dust Explosions and Fires Act of 2009* requires the Secretary of Labor to promulgate an interim final standard regulating combustible dusts, which will apply to manufacturing, processing, blending, conveying, repackaging, and handling of combustible particulate solids and their dusts (including organic dusts, plastics, sulfur, wood, rubber, furniture, textiles, pesticides, pharmaceuticals, fibers, dyes, coal, metals, and fossil fuels).
- It will not apply to processes already covered by the OSHA standard on grain facilities.



Congressional Action

- The standard would have to provide requirements for:
 - (1) a hazard assessment to identify, evaluate, and control combustible dust hazards;
 - (2) a written program that includes provisions for hazardous dust inspection, testing, hot work, ignition control, and housekeeping;
 - (3) engineering controls, administrative controls, and operating procedures;
 - (4) housekeeping to prevent accumulation of combustible dust in places of employment in depths that can present explosion, deflagration, or other fire hazards, including safe methods of dust removal;
 - (5) employee participation in hazard assessment, development of and compliance with the written program, and other elements of hazard management; and
 - (6) providing safety and health information and annual training to employees. The interim standard would have the legal effect of an occupational safety and health standard and would apply until a final OSHA standard became effective.



Congressional Action

- The legislation requires a final OSHA rule to include relevant and appropriate provisions of the National Fire Protection Association combustible dust standards.
- The legislation requires the Secretary of Labor to revise the hazard communications standard to amend the definition of "physical hazard" to include "a combustible dust" as an additional example of such a hazard
- The final OSHA rule mandated by the legislation would have to provide requirements for:
 - building design, such as explosion venting, ducting, and sprinklers; and
 - explosion protection, including separation and segregation of the hazard.



National Consensus Standards - NFPA

- National Fire Protection Association (NFPA) Handbook: “Any industrial process that reduces a combustible material and some normally noncombustible materials to a finely divided state presents a potential for a serious fire or explosion.”

- Articles 650-664 discuss control and prevention of dust explosions in various industries:
 - NFPA 61: Prevention of fires and dust explosions in agricultural and food processing facilities
 - NFPA 484: Combustible metals
 - NFPA 654: Prevention of Fires and Dust Explosions from Manufacturing, Processing and Handling of Combustible Particulate Solids (CD = 420 microns or smaller)
 - NFPA 655: Prevention of Sulfur Fires and Explosions
 - NFPA 664: Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

- Consensus standards can be used to show “industry recognition” of hazard in the employer’s industry (not just generally) and to support GDC citations, but “should” standards cannot be enforced nor to dictate abatement methods not required under specific standard.



NFPA 654 Recommendations

- Minimize escape of dust from process equipment or ventilation systems
- Use dust collection systems and filters
- Utilize surfaces that minimize dust accumulation and facilitate cleaning
- Provide access to all hidden areas to permit inspection
- Clean dust residue at regular intervals
- Use cleaning methods that do not generate dust clouds if ignition sources are present
- Only use vacuum cleaners approved for dust collection
- Locate relief valves away from dust hazard areas
- Implement inspection, testing, housekeeping and control program



NFPA 654 Recommendations

To control ignition sources –

- Use appropriate electrical equipment and wiring methods
- Control static electricity, including bonding of equipment to ground
- Control smoking, open flames and sparks
- Control mechanical sparks and friction
- Proper use of cartridge activated tools
- Use separator devices to remove foreign materials capable of igniting combustibles
- Separate heated surfaces from dusts
- Separate heating systems from dusts
- Proper use and type of industrial trucks
- Adequate maintenance of equipment



Best Practices

- Hazard Assessments
- Written programs
 - Training
 - Dust inspection and sampling
 - Control methodologies
- Engineering, administrative and operating controls to limit dust emissions and ignition sources
- Housekeeping controls
- Building design features (sprinklers, explosion vents)



Hazard Assessment

- Dust can be generated in various parts of production processes – goal is to eliminate factors that could contribute to explosion
 - Industries with combustible dust hazards are Class II Locations under the National Electrical Code (NEC)
 - Other dust hazards can include slips/falls, reduced visibility, health conditions from respirable dusts such as silica, coal or asbestos
- Explosions can occur where dust accumulates, is produced or stored, or is airborne
 - Electric installations where dust could be present should meet NEC Ch. 5 for hazardous locations



Locations Analysis

- Wood processing or storage silos;
- Bins and grain elevators;
- Flour and feed mills;
- Manufacture/storage of metal powders;
- Chemical or plastic production;
- Coal handling or processing areas;
- Food production generating dust - starch, spice, sugar, cocoa or candy;
- Pharmaceutical plants; Dust collection bins or bags;
- Nooks and crannies, inside equipment and above ceilings in variety of facilities



Ignition Sources

Explosion ignition sources include:

- Open flames (welding, cutting etc.)
- Hot surfaces (dryers, bearings, heaters)
- Heat from mechanical impacts
- Electrical discharges (switch and outlet activation)
- Electrostatic discharges
- Smoldering or burning dust
- Cigars, pipes and cigarettes



Other Analytical Factors

- ❑ Is vacuuming used rather than blowing or sweeping dust?
- ❑ Are accumulations of dust routinely removed from elevated surfaces?
- ❑ Is metallic or conductive dust prevented from accumulating around electrical enclosures or equipment?
- ❑ Are dusts present (e.g., wood dust) that can create own heat as possible ignition source?



Prevention

- ❑ Recognize that events can happen quickly, from a chain of events or factors – employees must be trained to recognize and detect early in chain
- ❑ Primary prevention is to minimize or eliminate fuel load with good housekeeping, ventilation, extraction and removal systems
- ❑ Dusty environments will require use of spark/explosion proof equipment (vacuums, other electrical equipment)
- ❑ Maintenance to eliminate minor system leaks is critical
- ❑ Do NOT use compressed air blowers to remove dust

Questions???

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