Senate Hearing: Chilworth Testifies at the U.S. Senate Hearing on Dust Explosion Hazards

Plainsboro, NJ, October 01, 2008 --(PR.com)-- On Tuesday, July 29, 2008, a hearing was convened in the Dirksen Office Building of the U. S. Senate, by the Employment and Workplace Safety Subcommittee of the Committee on Health, Education, Labor, and Pensions. The subject of the hearing was “Dangerous Dust: Is OSHA Doing Enough to Protect Workers?” The panel was led by Senator Patty Murray (D-WA), joined by Subcommittee Members Senator Johnny Isakson (R-GA) and Senator Sherrod Brown (D-OH), and with Senator Saxby Chambliss (R-GA) as an invited panel member.

Among the witnesses who provided expert testimony at the hearing was Richard W. Prugh, Senior Process Safety Specialist, Chilworth Technology, Inc. The testimony of the Chilworth representative may be observed at the following link: http://help.senate.gov/Hearings/2008_07_29/2008_07_29.html. A copy of the full written testimony is available from Chilworth by emailing safety@chilworth.com.

The other witnesses at the hearing were Edwin G. Foulke, Jr., Assistant Secretary of Labor for Occupational Safety and Health, Occupational Safety and Health Administration (OSHA), John S. Bresland, Chairman and CEO of the U.S. Chemical Safety & Hazard Investigation Board, Amy Spencer, Senior Chemical Engineer, National Fire Protection Association and Graham H. Graham, Vice President for Operations, Imperial Sugar Company.

Below is Richard Prugh's Testimony at the U.S. Senate Hearing on Dust Explosion Hazards.

Introduction

The “fire triangle” shows the necessary components of a fire. Similarly, the “explosion pentagon” shows the necessary components of a combustible-dust explosion.

The concentration of fuel in the oxidant is very important. For example, the Lower Flammable Limit (the “lean” limit) for gasoline is about 1% in air, and the Upper Flammable Limit (the “rich” limit) is about 6%; if the concentration is not between these limits, the mixture will not burn.

There is also a lower limit for combustible dusts, and it is termed the Minimum Explosible Concentration. For example, the lower limit for many dusts corresponds to two pounds of very-fine dust suspended in a 10'x12'x8' room, like a small bedroom.

There is a “rule of thumb” for explosible-dust concentrations. If you can see the thumb at the end of your outstretched arm, the concentration of dust is too low to propagate combustion; that is, too low to cause an explosion or a flash-fire.

All materials that are combustible can explode, under “the right” set of conditions.

The Right Concentration

Concentrations above the Minimum Explosible Concentration occur in many items of process equipment, and in dust collectors when the collected dusts are shaken or blown-back from the filters.

Very high concentrations of dust within rooms or buildings can occur when accumulations of dust are dispersed: from mechanical shock, a blast of air, dumping bags of powder, and vigorous sweeping.

Dense dust clouds also can occur when accumulations of dust at high elevations in rooms or buildings are disturbed by a “primary” explosion, and ignition of the descending and suspended dense dust cloud can result in a damaging “secondary” explosion.

High-elevation accumulations of dust can result from use of compressed air for cleaning equipment and surfaces. This results in lofting of very small particles to upper elevations, where they may settle onto horizontal surfaces. Such accumulations are a secondary explosion “waiting to happen”.

A Sufficient Source of Ignition

If the energy of an ignition source is not sufficient, propagating combustion cannot be initiated. For many combustible dusts, the Minimum Ignition Energy is very low, such that the electrostatic energy on the human body can cause propagating combustion. Other ignition sources are electrical arcs, flames, hot surfaces, and the electrostatic energy on ungrounded equipment.

Confinement of Combustion

If the combustion of a mixture of dust and air is confined, the resulting hot combustion gases can generate very high pressures. Such pressures can rupture equipment, destroy walls and ceilings of rooms and buildings, and threaten personnel.

Preventing Explosive Combustion of Dust/Air Mixtures

- The oxidant (the oxygen in air) can be forced out of process equipment by an inert gas (such as nitrogen or carbon dioxide).
- An inert powder or mist can quench or suppress the combustion.
- The process equipment can be constructed to “contain” the maximum pressure that could be developed by a dust/air explosion.
- Local exhaust ventilation can be provided at equipment openings where dust is generated or released.
- The explosion can be vented, to minimize the pressure generated by the combustion gases.

Unconfined Combustion

When combustion of a small dense dust cloud occurs in an unconfined space, the result can be a flash-fire. Persons inside the flash-fire are at risk of serious injury, particularly if they are wearing combustible clothing. Thus, persons who handle dusty combustible powders should be wearing flame-resistant clothing.

Models for Control of Combustible-Dust Hazards

At the present time, there exist several legislated and guidance documents that could serve as models for Federal rules for dust-hazard controls.

- The General Duty Clause is often used by OSHA when there is no specific standard that applies to a recognized hazard in the workplace.
- OSHA frequently cites “housekeeping” standards, but these standards do not address the need for preventing and removing accumulations of dusts on elevated surfaces or address many important ignition sources, such as hot surfaces, static electricity, and open flames or welding sparks.
- The OSHA Process Safety Management Standard does not address combustible dusts. However, this standard provides good guidance and could be applied to control of combustible-dust hazards.
- The OSHA Grain Handling Facilities standard could be modified to serve as guidance for control of combustible-dust hazards.
- The “Combustible Dust” NFPA 654 standard provides very good guidance for controlling combustible-dust hazards.
- The Georgia Rules and Regulations of the Safety Fire Commissioner list 76 NFPA Codes and Standards, many with the statement “Facilities . . . shall comply with this standard as a mandatory requirement.”

Key Points in the Prevention of Combustible-Dust Explosions

A. The Problem

1. A very high percentage of dusts are combustible, including solid hydrocarbons (such as polyethylene), carbohydrates (such as grains), and many metals (such as aluminum).
2. Every combustible material will create an explosion with the right conditions.
3. Limited generic data are available concerning the properties of combustible dusts; data may need to be developed through testing.
4. At present, all 50 states “administer” the International Building Code, which contains extensive requirements for explosion protection for combustible dusts, but there is very modest enforcement of this Code

B. The Solution

1. Companies that produce, process, or handle combustible dusts and powders need to determine the explosibility properties of their materials. These data should then be formally communicated within their organizations and to their customers.
2. Plant operators should assess the hazards that are associated with processes that are operating in their plant.
3. Existing today are the technology and knowledge; codes, standards, and guidelines; and engineering expertise that are needed to protect personnel and property from combustible-dust explosions.
4. An objective of the proposed Federal legislation should be to require plant operators to adopt and abide

by the above guidance toward solution of the existing dust-explosion “problem”.

Other Chilworth News

The last of three in Chilworth technology's 2008 series of Fire, Explosion & Thermal Hazards Training Courses is being held at the Hampton Inn Tropicana in Las Vegas, NV the week of October 20-24, 2008. In the 2008 training series the following courses are offered:

- Understanding & Controlling Electrostatic Hazards
- Dust Explosion Prevention & Protection Techniques (including Elements of OSHA Combustible Dust national Emphasis Program)
- Gas/Vapor Explosion Hazards
- Evaluation and Selection of Electrical and Non-Electrical Equipment for use in Hazardous Areas
- Chemical Reaction Hazards

To view a brochure of this training series, please click here:
http://www.chilworth.com/2008FlyCourseBrochure.pdf

Individuals/companies having any questions or would like any additional information, should email Chilworth Technology at: safety@chilworth.com or view their website at: www.chilworth.com.

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