



## COMBUSTIBLE DUST HAZARDS IN THE WELDING AND CUTTING ENVIRONMENT

### INTRODUCTION

A dust hazard analysis is required when combustible dust may be present. Combustible dusts are a serious workplace hazard. Airborne clouds of these dusts are easily ignited, resulting in the rapid, violent spread of fire (deflagration or flash fire). If confined inside a structure, the pressure can build up creating an explosion. Deflagration or explosion can cause loss of life and property damage. Welding and other hot work operations initiate many workplace combustible dust explosions. Dust trails on surfaces can act as a fuse to serve as a source of ignition in other areas. Therefore, welders should understand the factors that contribute to combustible dust hazards.

Industries that process or generate combustible dusts include: metallurgical, textile, mining, plastics, rubber, pharmaceutical, lumber, food processing and agriculture, and a wide range of manufacturing processes. During processing of combustible solids and powdered materials, dusts can become airborne when conveyed, dumped, mixed and transferred. These dusts may also collect on surfaces and present a potential hazard if released into the air. Process controls should be used to collect these dusts to prevent them from escaping into the work environment. Dust control equipment must be designed to avoid

creating dust explosion or deflagration hazards. Housekeeping practices must be sufficient to prevent fugitive dust accumulation on surfaces.

### NATURE OF THE HAZARD— COMBUSTIBLE DUSTS

Not all dust is combustible. In fact, limestone dust is used in coal mines to reduce explosion hazards. However, materials which can burn or corrode in contact with oxygen can form combustible dusts. These “reactive” materials include: metals, plastics, coal and other carbonaceous materials, grains, wood and paper, and many organic compounds such as additives, solid food products and pharmaceuticals. Dusts vary in their potential for combustion and in how violent their airborne dust deflagrations may be.

For a dust deflagration to happen, it takes a big enough and dense enough cloud of the dust to become airborne at one time and then contact an energy source strong enough to cause ignition. For some dusts it may take only a static spark to ignite a dense cloud, while others might require an open flame or contact with a hot surface. Understanding how dense is a dust cloud and what kinds of energy sources are needed to make an ignition hazard can only be learned through specialized lab testing.

A small explosion or other shock will stir up settled dust into the air. This makes a big cloud, which is often ignited by the heat of the first explosion.

It is also important to understand that finer dust particles become airborne more easily - and also ignite more easily.

## **HOW TO AVOID THE HAZARD— WHAT TO LOOK FOR**

If dusts or powders are processed or handled in a workplace, or if dusts are visible in the air or on surfaces, find out what is in the dust. Ask for Safety Data Sheets (SDSs), and look them over for flammability and combustibility data. Find out if the dust is reactive or combustible. Combustible dusts should not be allowed to collect on surfaces to depths > 1/32". Compressed air or steam should never be used to clean such dust deposits on surfaces. Proper housekeeping requires special tools like explosion proof vacuums.

Dusts contained inside processing equipment and/or ventilation systems can deposit in ducts, and become concentrated in collection devices like bag houses. Equipment used to store, collect or handle combustible dusts requires special design features to reduce the risk of deflagration.

### **PRECAUTIONS:**

- Always understand the materials that may be present in the environment, and check when you are not sure.
- Never use compressed air for cleaning powdered materials and dusts.

- Never weld or do other hot work where combustible dusts are present on surfaces or where they might become airborne. Check adjacent and concealed spaces for dust. Consult with your supervisor or safety professional if you are unsure about the risks or safety requirements.
- Never work on equipment that handles or collects combustible dusts unless you are authorized to do so and have the required training.
- Always be extra careful about electrical safety, including static charge buildup.
- Always follow all safety precautions, hot work procedures and other steps designed to prevent dust explosions.

## **SUMMARY**

It is important to understand the materials present in the work environment and if any of their dusts might be flammable or combustible, or have other hazards. The dusts or powdered forms of certain types of solid materials can be ignited by a sufficient energy source if enough of it gets airborne at one time. This makes it doubly important for those who conduct welding and its allied processes to know if this hazard is present and to take the appropriate steps to prevent potentially devastating dust explosions.

## INFORMATION SOURCES

Chilworth Technology, Inc., "Testing to Assess Explosion Characteristics of Dust Clouds"; Vahid Ebadat, NFPA Symposium on Dust Explosion Hazard Recognition and Control, Baltimore, May 13-14, 2009.

Chilworth Technology, Inc., Presentation: "Dust Explosion Prevention and Protection"; Dehong Kong; Princeton, NJ. May 13, 2008.

CEP Magazine, Suzanne Shelly, Contributing Editor, "Update Preventing Dust Explosions"; March 2008. Powder and Bulk Engineering, Presentation: "Dust Collection: Minimizing Dust Generation in Solids Handling Equipment"; Gary Q. Johnson; November 5, 2008.

National Fire Protection Association (NFPA). *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, processing, and Handling of Combustible Particulate Solids* (NFPA 654), available from National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269–9101, telephone: 800–344–3555, website: [www.nfpa.org](http://www.nfpa.org).

National Fire Protection Association (NFPA). *Standard on the Fundamentals of Combustible Dust* (NFPA 652), available from National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269–9101, telephone: 800–344–3555, website: [www.nfpa.org](http://www.nfpa.org).

National Fire Protection Association (NFPA). *Standard on Explosion Protection by Deflagration Venting* (NFPA 68), available from National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269–9101, telephone: 800–344–3555, website: [www.nfpa.org](http://www.nfpa.org).

National Fire Protection Association (NFPA). *Standard on Explosion Prevention Systems* (NFPA 69), available from National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269–9101, telephone: 800–344–3555, website: [www.nfpa.org](http://www.nfpa.org).

Occupational Safety and Health Administration (OSHA). Combustible Dust National Emphasis Program (OSHA Instruction CPL-03-00-008). Website: [www.osha.gov](http://www.osha.gov).

American Welding Society (AWS). *Safety and Health Fact Sheets*, published by the American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166; telephone 800-443-9353; website: [www.aws.org](http://www.aws.org).