

The Case for Combustible Dust

By Rod Kurtz, Dawson-Macdonald Co.

That's right, dust can explode.

Common materials, when used in the right forms and in the right proportions, can become combustible or explosive. Would you believe that sugar or cornstarch could explode? Metallic materials, in forms commonly referred to as "dust" or "particulate," in the presence of oxygen and an ignition source can also generate violent explosive forces. If you generate these from materials such as aluminum, chromium, iron, bronze, or magnesium, just to name a few, you could have an explosive potential on your hands.

The government is now taking an active role in identifying and mitigating this potential hazard. Guidelines issued by the National Fire Protection Association (NFPA) are now becoming standards to be used by OSHA, state and local agencies, and/or local fire marshalls in determining where a potential explosion hazard exists, and what is to be done to correct it. They look to the end user for ultimate responsibility, for identification and resolution.

Dust collectors, ductwork carrying dust or particulate, and any other device where these may settle or congregate form potential trouble spots that should be investigated. If the 3 elements of combustion [1- fuel (or in this case the dust or particulate), 2- oxygen, and 3- an ignition source (such as a spark caused by static electricity or friction)] exist in any of these places, and the proportions of fuel to oxygen are correct, then an explosion, or at the least some form of combustion, is very likely.

Industries at risk could include chemicals, food, plastics, wood, paper and pulp, rubber, metal processing, and recycling, among many others.

The indicators that define just how combustible a dust might be are called Kst (which is simply the slope of the pressure-versus-time curve multiplied by the cube root of the volume of the test chamber) and Pmax (the maximum pressure recorded in a contained explosion). The higher the values of Kst and Pmax, the more combustible the dust. Representative values are:

	<u>Kst (bar-meter/sec)</u>	<u>Pmax (bars)</u>
Coal	129	9.2
Sugar	138	8.5
Polyethylene	156	8.0
Cornstarch	202	10.3
Wood dust	224	10.3
Magnesium	508	17.5
Aluminum	515	11.2

Typically, a value of Kst below 200 is slightly combustible and could yield a weak explosion, from 200 to 300 is moderately combustible with a strong explosion, and above 300 is extremely combustible with a very strong explosion. For dusts approaching a Kst of 600, dry collection methods are not recommended, but rather wet collection equipment is utilized. Several private test labs can generate this data, requiring generally a material sample of 2 to 3 pounds.

Once this determination is made, then appropriate safeguards can be specified. These can include:

- Explosion Vents
- Flameless Venting - extinguishes the flame but allows the pressure wave to travel
- Fast-acting Isolation Valves - to stop the travel of both the flame and pressure wave
- Fast-acting Chemical Fire Retardant Injection Systems
- Improved housekeeping to prevent the accumulation of dust
- Controlling potential ignition sources, such as static electricity, open flames, sparks, heated surfaces, and electrical devices

The following documents cover various aspects of the handling and controlling of combustible dust:

- NFPA Std. No. 68: Standard on Explosion Protection by Deflagration Venting
- NFPA Std. No. 69: Standard on Explosion Prevention Systems
- NFPA Std. No. 484: Standard for Combustible Metals
- NFPA Std. No. 654: Standard for Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- OSHA Directive CPL 03-00-008: Combustible Dust National Emphasis Program
- OSHA Combustible Dust Standard: tentative release date April 2011

It should be emphasized that the end user is ultimately responsible for compliance and that no equipment is "grandfathered."

Consultancies are available to provide help in addressing this important issue with you, and to provide solutions to protect both life and property. Dawson-Macdonald Co. can provide assistance as required. For more information contact Dawson-Macdonald Co., Inc., 845 Woburn Street, Wilmington, MA 01887, toll-free 800-556-4456, fax 978-657-8740, e-mail info@dawson-macdonald.com or visit their web site at www.dawson-macdonald.com.

