Dust explosion #1

What you don't know can hurt you

by Brad Carr, President of IES, USA

With combustible dust issues, ignorance is not bliss. The reverse is true: ignorance is deadly.

Mills are especially vulnerable, as recent history suggests. The aim of this article is to fill the knowledge gap at the foundational levels to managers and owners who can determine what is missing from their plan to mitigate the dangers of combustible dust.

What don't you know that can hurt you?

To fulfill the purpose of this article, the full scope of specific things that should be on your 'to do' list for combustible dust are listed. Seven steps are outlined as below to help you see what categories of activities need to take place.

STEP 1: first things first

Safety starts by acknowledging that you have combustible dust. But not every company has to test their dust to determine the combustible characteristics of their dust if it is obvious, like flour dust, for example. It doesn't matter what the Kst, Pmax, MEC, MIE, MIT, etc. is; whatever the industry, you know you have to keep the dust from accumulating.

I have found that most people test the composition of their dust after having being fined by the Occupational Safety and Health Administration (OSHA). But they would not have had to do it if they had prevented the dust from accumulating in the first place.

So whatever the composition of the dust, it must be eliminated because all fugitive dust can accumulate into a combustible cloud. The diagram shows the factors that can precipitate an explosion.

This model identifies the five elements required for such an explosion:

1. Fuel - or the combustible dust itself
2. Oxygen - in the air
3. Ignition Source - heat from electrical equipment, smoking, bearings, static electricity, etc.
4. Dispersion - accumulated dust falling from overhead areas due to an initial explosion (deflagration)
5. Confinement - for example, the building itself.

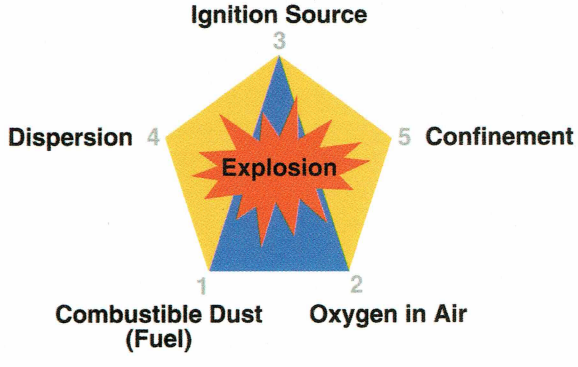
This diagram is helpful in that it clarifies the possible cause, or combination of causes. The logic is that eliminating one or more of these elements would lower the risk of an explosion. So, let's look at the real world and think about what you can really control or eliminate.

You can't eliminate oxygen - you and your employees have to breathe. You can't eliminate confinement - that's where the work happens, and without that there is no product or business. And you can only eliminate dispersion as a variable by eliminating the combustible dust itself.

So that means that the only factors you can control are the fuel - the combustible dust, and the Ignition Source - the generation of extra heat from equipment that eventually degrades or breaks down without anyone maintaining it properly.

Let's face it: equipment breaks down, and maintenance mistakes happen. It's the inevitable factor of human behavior, which, by its very definition, is always flawed. We don't live in a perfect world.

This process of elimination demonstrates that the most logical factor to wrestle with - and to manage effectively - is to control the accumulation of the combustible dust. This is exactly why the regulations spend so much time dealing with housekeeping issues; you simply must find a way to eliminate the accumulated fugitive dust or you risk your employees' safety. But what regulations matter most to grain and feed industries?



The diagram shows the factors that can precipitate a dust explosion, identifying the five elements required.

STEP 2: the regulations that matter

OSHA compliance is premised on adherence to standards recommended by experts, like the National Fire Protection Association (NFPA) and the Chemical Safety Board (CSB). Make sure you have a strong working knowledge of the standards for our industry. Here are the essentials:

- NFPA 654: Standard for the Prevention of Fires and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible (This is the umbrella standards used across a variety of industries)
- NFPA 61: Standard for the Prevention of Fires and Explosions in Agricultural and Food Processing Facilities

NFPA also issues NFPA 70: National Electrical Code®, with useful information. Visit www.nfpa.org for a copy of the standard(s) that best fits your business.

Also, be sure to take note of Specific OSHA violations cited under their General Industry General Duty Clause found in:

- 29 CFR 1910.22 – General Requirements: Housekeeping
- 29 CFR 1910.38 – Emergency Action Plans
- 29 CFR 1910.94 – Ventilation
- 29 CFR 1910.197 – Spray Finishing Using Flammable and Combustible Materials

These are all safety standards related to different facets of dealing with combustible dust, and must be considered as part of your Risk Assessment Checklist and/or Combustible Dust Safety Checklist.

STEP 3: another essential: a risk assessment checklist

Unfortunately, many companies miss this step, and don't initiate this kind of document. It is critical to do this analysis - or hire a third party to do it for you. The risk assessments vary by type of product processed and type of building structure.

The assessment should include specific tolerances for

- Factors for ignition sensitivity
- Projections for severity of possible explosions
- Temperature stability of environment

STEP 4: create a combustible dust safety checklist standard operating procedure (SOP)

Any business that generates combustible dust should have an SOP for controlling it. Here again, the elements of the checklist will vary depending on the type of dust generated.

But here are some areas people overlook that should be part of your checklist:

- Do not assume that an OSHA-approved tip for compressed air means that it is safe for removal of combustible dust at any pressure. The 30 PSI limit is set to prevent a combustible dust cloud.
- If you have central filtration systems, make sure your safety sensors are all working. Extinguishing systems, abort gates and diverters also need to be checked regularly. The interval of inspection varies by manufacturer, so check with your manufacturer to get their recommendation.
- If you are cleaning an area to remove accumulated dust, turn off all the power. Don't assume that because it is off at the breaker that the entire system is off.
- It is essential to maintain the filter material in your filtration system. The slightest tear in the filter decreases the integrity of the media. This then allows the fugitive dust to circulate through again. Even small openings can keep you out of compliance.
- There are engineered solutions available that prevent dust from accumulating. These are in sharp contrast to managed solutions, where you are cleaning up after the dust already exists. Make sure you know your options to proactively deal with the problem.

John Allen, president of J. Allen Resources, reports that,

"Most companies are still dealing with dust after the danger has been created. They see clean up as a cost of doing business, tolerating a wide range of dust accumulation. Now there are engineered alternatives to this roller coaster scenario. People are just not aware of them.

STEP 5: provide training sessions

You have to train members of staff. That's when the checklists come to life. This is a systemic – and systematic – undertaking that needs to take place. Your employees need to know the realities of what to look for and what can be done – and that they can be killed by an explosion if they don't pay attention to their work in this area. Keep the training practical.

You don't have to reinvent the wheel to make this happen. Yes, you can hire third parties to help train for your particular needs. But in late September of 2014, NFPA launched online training courses on the general standards in NFPA 654 to provide the groundwork.

There are three modules in the series:

1. Hazard Identification
2. Hazard Evaluation
3. Hazard Control

Guy Colonna, Division Manager, Industrial and Chemical Engineering for NFPA, was the primary force behind these courses. He explained that,

"If you are managing a facility where this standard applies, it is essential that you understand the elements…and that your workers are aware as well."

STEP 6: don't overlook special class II conditions

Class II locations relate to combustible dust. NFPA 499: Recommended Practice for the Classification of Combustible Dusts and or Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas provides two divisions within Class II.

In NFPA 499, Class II Division 2 is defined as a combustible atmosphere existing during abnormal conditions of dust accumulations <1/8" but obscure the surface color. It doesn't take much to create Class II Div 2 condition according to this standard.

STEP 7: review steps one to six every year

Complacency with the status quo is the biggest enemy of controlling combustible dust. As Rafael Moure-Eraso, Chairman of the United States Chemical Safety Board (CSB) stated in the New York Times (8.23.14), "Inaction could cost lives." He cited that in the United States alone, CSB documented 50 combustible dust accidents from 2008-2012 that resulted in 29 fatalities and 161 injuries.

You can't afford that. You have to work hard to build a culture in your company that sees the seriousness of this threat.

I suggest revisiting these steps annually, at least. Give your employees the authority to act. Make this task part of their annual performance review. Then reward those who complete the tasks responsibly by commending them across the company.

I know that the new OSHA regulations are tabled at this point. But we shouldn't do the right thing to prevent a fine. We should do the right thing to prevent an explosion or a fire. We know the steps - so let's get started.

About the author

Brad Carr is president of IES, manufacturer of SonicAire® fans. Carr has had numerous invitations to speak on safety issues with combustible dust at events for a wide range of industries. Carr has also published many articles on this topic in trade magazines for a broad spectrum of industries. SonicAire fans were highlighted as a Safety Innovation Award at GEAPS 2015. For a Special Report specific to your industry, contact him at bcarr@iesclean.com or call 336.712.2437.