

Can old dust collectors comply with the latest combustible dust standards?

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Dust collectors can deliver superb service for many years. However, there is a potential downside to this longevity that can present a hazard if an older collector is handling a combustible dust. Older collectors may not be properly situated or equipped for a dust explosion, but there may be ways to bring them into compliance. This article defines combustible dust, as well as discusses considerations for retrofitting an existing dust collector with an explosion venting system.

Both the good news and the bad news about dust collectors is that these durable systems have a long life span. Dust collectors can deliver superb service for many years. It is not unusual to find units in the field that are 20 years old and are still working as good as new, even though they may be lacking technological improvements in performance and energy efficiency. However, there's a potential downside to this longevity that can present a hazard if an older collector is handling a combustible dust: older collectors may not be properly situated or equipped for a dust explosion. But there may be ways to bring them into compliance.

Combustible dust under greater scrutiny

It's a given that various types of fumes and vapors present fire and explosion hazards. But dust somehow escapes the same common-sense concerns that might be applied to solvent vapors, for example. According to OSHA and the U.S. Department of Labor, there have been at least 350 combustible dust explosions in the United States since 1980, killing 130 workers and injuring nearly 800. Some explosions in

recent years have been caused by sugar dust in a packaging plant, aluminum dust in a wheel-casting facility, polyethylene dust in a rubber and plastics processing facility, and phenolic resin dust in a plant that manufactures fiberglass automotive insulation.

As a result, OSHA has placed more emphasis on combustible dust safety in recent years and has sent letters to approximately 30,000 companies in the United States that may be at risk for a combustible dust incident. The letters warned of the potential dangers at these facilities based on the type of materials being processed. The National Fire Protection Association has also reissued its NFPA 68 Standard on Explosion by Deflagration Venting. The completely revised guideline was upgraded to a standard that is enforceable by OSHA. It highlights five main points.

- NFPA 68 spells out mandatory requirements for collecting explosive dusts and is to be treated as code that is enforceable by local, state, and national authorities.
- Companies that handle dusts are required to test and document explosibility of dusts within their facilities. Any dust rated above 0 Kst in explosibility is considered explosive, and explosion venting or alternative protection is necessary. (Kst is the maximum rate of pressure rise in a specifically sized test vessel. The units are bar-meters per second.)
- Companies that handle dusts are required to conduct a Commission Hazard Analysis (also called a risk assessment) on their dust collection systems.
- Companies are required to maintain specific documentation, including test reports, equipment owners' manuals, and maintenance reports on their



How to evaluate your existing dust collector

If you are working with a combustible dust, start by evaluating the location and construction of your current dust collector. If your system is indoors, it should be located close to an external wall and then vented through the wall. Outdoor dust collectors should be situated in an open, unpopulated area to avoid potential explosion damage to adjacent property or structures. A fireball can extend up to 50 feet, so ample space is necessary in both scenarios.

This outdoor dust collection system uses an explosion vent on the top of the collector.

dust collection systems for inspection by an Authority Having Jurisdiction (AHJ) agent.

- Companies are required to schedule inspections on explosion-venting equipment at least annually and possibly more often.

What is a combustible dust?

According to OSHA, a combustible dust is a solid material composed of distinct particles or pieces, regardless of shape or chemical composition. The small particle size present in the materials presents a flash-fire or explosion hazard as a result of their ability to propagate combustion when dispersed in the correct proportion in air or a process-specific oxidizing medium. (See list on page 24.)

Materials that may be combustible in dust form include metals (such as aluminum, iron, zinc, chromium, and magnesium), wood, coal, plastics, biosolids, sugar, paper, soap, and certain textiles. In fact, most natural and synthetic organic materials, as well as some metals, can form combustible dust. As a result, explosion hazards exist in a variety of industries, including food (such as cereal, candy, sugar, spice, starch, flour, feed), grain, tobacco, plastics, wood, paper, pulp, rubber, furniture, plastics, textiles, pesticides, pharmaceuticals, dyes, coal and fossil fuel power generation.

Two other important areas then need to be defined: the pressure capacity of the cabinet, and the construction of the cabinet itself.

A typical dust collector installed in the last 40 years is probably going to be designed for maximum pressures of ± 15 to 20 inches of water gauge static pressure (w.g. SP). The equipment owner's manual may provide this information, or you can contact the manufacturer of the original dust collector to obtain the parameters of your cabinet's design pressure in inches of w.g. SP, or lb / sq in. gauge (PSIG). Once you have this information, you can decide whether or not it is even feasible to install an explosion venting system on your existing collection equipment. What determines feasibility? An explosion vent is essentially a carefully engineered "weak point" in a collector cabinet wall or ceiling that "gives" at a certain pressure to vent an explosion in a relatively safe direction and temporarily contain a fire. For the vent to work correctly, you must be certain that the cabinet itself is engineered to contain a higher pressure than that of the vent you plan to install. NFPA 68 provides extensive engineering guidelines for sizing and installing explosion vents and should be consulted before embarking on any retrofit.

The next important point to address involves the assembly of the existing collector: is it fully welded or bolted construction?

Combustible dust by category

What is a combustible dust? In the right particle size and concentration, numerous materials can fuel a combustible dust explosion. Here's a list developed by OSHA. It can also be accessed at www.osha.gov/Publications/combustibledustposter.pdf.

Agricultural Products

Egg white
Milk, powdered
Milk, nonfat, dry
Soy flour
Starch, corn
Starch, rice
Starch, wheat
Sugar
Sugar, milk
Sugar, beet
Tapioca
Whey
Wood flour

Agricultural Dusts

Alfalfa
Apple
Beet root
Carrageen
Cocoa bean dust
Cocoa powder
Coconut shell dust
Coffee dust
Corn meal
Cornstarch
Cotton
Cottonseed
Garlic powder
Gluten
Grass dust
Green coffee
Hops (malted)

Lemon peel dust
Lemon pulp
Linseed
Locust bean gum
Malt
Oat flour
Oat grain dust
Olive pellets
Onion powder
Parsley (dehydrated)
Peach
Peanut meal and skins
Peat
Potato
Potato flour
Potato starch
Raw yucca seed dust
Rice dust
Rice flour
Rice starch
Rye flour
Semolina
Soybean dust
Spice dust
Spice powder
Sugar (10x)
Sunflower
Sunflower seed dust
Tea
Tobacco blend
Tomato
Walnut dust
Wheat flour
Wheat grain dust
Wheat starch
Xanthan gum

Carbonaceous Dusts

Charcoal, activated
Charcoal, wood
Coal, bituminous
Coke, petroleum
Lampblack
Lignite
Peat, 22% H₂O
Soot, pine
Cellulose
Cellulose pulp
Cork
Corn

Chemical Dusts

Adipic acid
Anthraquinone
Ascorbic acid
Calcium acetate
Calcium stearate
Carboxymethylcellulose
Dextrin
Lactose
Lead stearate
Methylcellulose
Paraformaldehyde
Sodium ascorbate
Sodium stearate
Sulfur

Metal Dusts

Aluminum
Bronze
Iron carbonyl
Magnesium
Zinc

Plastic Dusts

(poly) Acrylamide
(poly) Acrylonitrile
(poly) Ethylene (low pressure process)
Epoxy resin
Melamine resin
Melamine, molded (phenol-cellulose)
Melamine, molded (wood flour and mineral filled phenol-formaldehyde)
(poly) Methyl acrylate
(poly) Methyl acrylate, emulsion polymer
Phenolic resin
(poly) Propylene
Terpene-phenol resin
Urea-formaldehyde/cellulose, molded
(poly) Vinyl acetate/ethylene copolymer
(poly) Vinyl alcohol
(poly) Vinyl butyral
(poly) Vinyl chloride/ethylene/vinyl acetylene suspension copolymer
(poly) Vinyl chloride/vinyl acetylene emulsion copolymer



Dust collectors with explosion venting can safely be used indoors with venting through an exterior wall, as shown here.

Dust collectors with a bolted construction lend themselves better to retrofitted explosion vents because sections can be taken apart. A side wall can be unbolted, properly cleaned, and then cut or welded. This flexibility makes it easier to add an explosion vent and then bolt the panel back into place. Another option is to purchase a complete replacement panel with an explosion vent already installed, and bolt the new panel into place. Like all service performed for explosion protection, you should work directly with the equipment manufacturer or a professional in the dust collection industry to determine what will work best for your system.

In addition to explosion venting, a fire-suppression system can also be considered for retrofit. The most commonly used is a sprinkler system.

It is trickier to retrofit explosion venting or fire suppression to a fully welded dust collector cabinet. Burning or cutting a hole to add an explosion vent, for example, can cause an explosion because there is dust inside the collector. This dust needs to be removed and washed off before cutting into the cabinet. After the explosion vent hole has been cut and finished, a frame then needs to be bolted or welded to the housing so the explosion vent can be mounted. If you attempt this type of solution, it is strongly recommended that you have a fire crew on hand while you perform the work.

An explosion-prevention system that constitutes the highest level of protection requires a dust collector that is carefully engineered from the outset to function safely due to the increased internal pressure demands. If you choose a suppression system, you will also need to install a new dust collector.

Not all existing dust collectors can be retrofitted with explosion protection. However, retrofitting is possible under the right set of construction conditions, and this option may provide your company a cost-effective solution that complies with recent combustible-dust safety standards. Regardless of your decision to retrofit an existing dust collection system or to purchase new equipment, it is important for your company to stay up to date on explosion protection.

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