

# When the Dust Settles: Combating Combustive Dust in Food Manufacturing



When thinking about explosive materials, there are many things that come to mind – gasoline, gunpowder, paint, etc. Rarely does one ever think about sugar dust, an organic material that with the right conditions and a small spark can create a devastating explosion equivalent to that of a bomb.

In 2008, the Imperial Sugar refinery in Port Wentworth, GA tragically experienced this first hand when finely ground motes of sugar caused an explosion at the factory killing 14 workers; combustible dust has been hovering as a national headline ever since. The tragedy sparked serious finger-pointing and brought to light a catastrophic issue that was hiding in the shadows of nearly every industrial plant that handles dry solids. The Department of Labor's Occupational Safety and Health Administration (OSHA) was quickly put on the hot seat, but they responded fast and with a message heard loud and clear: there are an estimated 30,000 U.S. facilities at risk for a combustible dust fire or explosion, and the agency is going to show up unannounced at as many of those plants as possible.<sup>1</sup>

The Occupational Health and Safety Administration's announcement of random inspections also came with a re-issue of CPL 03-00-008, their National Emphasis Program (NEP) on Combustible Dust that calls attention to the agency's rigorous expectations for combustible dust-related explosion prevention. The NEP also outlines what OSHA auditors will be looking for during their visits, items such as dust accumulation of more than 1/32", the thickness of a paperclip, covering more than 5% of a plant.<sup>2</sup>

Since traditional methods like sweeping and compressed air hardly combat fine dust, food manufacturing facilities often meet these standards with shop-style vacuums. Although these vacuums might be OK for general cleaning of dust and debris, using them to collect combustible dust like sugar and cinnamon can not only be deadly, it may also violate the requirements set forth in OSHA's Combustible

Dust NEP, which calls for electrical vacuums used in dusty areas to be approved for the hazard-classified location, as required under standard 1910.307(b).<sup>3</sup> Unfortunately, most plant supervisors assume the machinery in their plants is explosion-proof, including the industrial vacuums, but as seen in multiple tragedies, it often isn't the case. In fact, using a vacuum that is not certified explosion-proof to collect materials classified explosive by the National Fire Protection Agency (NFPA) actually adds to the risk of explosion.

### Certifiable Explosion-Proof: Beware of "Dress Up"

An "explosion-proof" vacuum (EXP) is explosion-proof to the core. This means that everything from the outer shell to the internal mechanics including the motor, switches, filters and inner chambers, is grounded and constructed of non-sparking materials like stainless steel. Some industrial vacuum companies offer basic models dressed up with a few antistatic accessories and describe them as suitable for explosive material. These imposters can still create arcs, sparks or heat that can cause ignition of the exterior atmosphere and overheating that can ignite dust blanketing the vacuum.

Purchasing an explosion-proof/dust ignition-proof vacuum approved by a nationally recognized testing laboratory such as the Canadian Standards Association (CSA) or Underwriters Laboratories (UL) will protect buyers from purchasing a poser, by providing legal certification that the vacuum can be used in a particular NFPA-classified environment. It ensures every component in the vacuum from the ground up meets strict standards for preventing shock and fire hazards.

### Explosion-Proof Vs. Air-Operated

Although food facilities often use pneumatic machinery, there are times when electricity is unavailable or undesirable. For these environments, air-operated vacuums for hazardous locations are excellent alternatives, but just because a vacuum is air-operated

doesn't make it explosion-proof. Pneumatic vacuums being used to collect combustible dust, should still be constructed of non-sparking materials and outfitted with ignition-proof parts and accessories that meet the highest level of operational safety.

### Filtration

Superior filtration does not have to be sacrificed on an explosion-proof model, especially in food plants where contamination control is critical. For peak safety and operating efficiency, an EXP vacuum should have a multi-stage, graduated filtration system, which uses a series of progressively finer antistatic filters to trap and retain particles as they move through the vacuum. In order to eliminate combustible dust from being exhausted back into the ambient air, a HEPA or ULPA filter can be positioned after the motor to filter the exhaust stream. Quality HEPA filters offer an efficient, effective way to trap and retain the smallest dust particles, down to and including 0.3 microns. An ULPA filter captures even smaller particles, down to and including 0.12 microns.

### Spill Response

Spill response should also be taken into account when purchasing an explosion-proof vacuum. Although OSHA's National Emphasis Program is specifically looking at companies that handle dry solids, manufacturers' maintenance plans are also under the microscope. If workers might need to collect flammable or explosive chemicals, a wet-model explosion-proof vacuum should be considered, also available in both electric and air-operated versions.

### Conclusion

Unfortunately, the Georgia sugar plant wasn't the first or last industrial workplace blast. The U.S. Chemical and Safety Hazard Investigation Board estimates there are on average ten explosions, five fatalities and 29 injuries per year as a result of combustible dust-related incidents,<sup>5</sup> and on February 3, 2009, nearly a year to the day after the sugar blast in Georgia,

a power plant in suburban Milwaukee joined the list of growing list of companies making headlines for falling victim to combustible dust. Although there were no fatalities, six workers were seriously injured and substantial fines are sure to follow.

Purchasing a high-quality, certified explosion-proof vacuum is a solid first step in preventing a combustible dust-related explosion, and picking the right vacuum often raises a lot of questions, especially when it comes to disaster prevention. Like all investments, pre-sale research is key. Plant managers shouldn't hesitate to ask the vacuum manufacturer for an onsite analysis of their vacuum needs in order to recommend what type of explosion-proof vacuum, hose and accessories are needed for the application. With the right equipment, the vacuum can be used to collect dust from the floor, booth walls, and even overhead pipes and vents to meet OSHA requirements. And naturally, every manufacturer will be responsive to your needs before you buy, so look for a company that will still be there "after the dust settles." Excellent post-sale support and training will make things easier when it's time to purchase replacement parts and filters or service the vacuum.

If used consistently and in conjunction with a comprehensive maintenance plan, your facility's investment in an explosion-proof vacuum will result in much more than just a clean plant. It will increase productivity, protect your employees, and keep you out of the headlines.

## Steps to Control Combustible Dust

An ignitable material, an ignition source and oxygen are all it takes for a potential explosion at your facility. Most manufacturing plants have all three. In 2006, fatalities involving explosions and fires increased by 26% in the manufacturing sector according to the Bureau of Labor Statistics' Census of Fatal Occupational Injuries. In addition to injuries, explosions cost companies millions of dollars. Between 1992 and 2002, Factory Mutual Global's pharmaceutical and chemical clients experienced dust explosions resulting in \$32 million in losses. And OSHA has estimated that there are approximately 30,000 U.S. facilities at risk for combustible dust explosions. Simply put, there's a lot of stake.

NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, contains comprehensive guidance on the control of dust to prevent explosions. The following are some of its recommendations:

- Minimize the escape of dust from process equipment or ventilation systems;
- Use dust collection systems and filters;

- Utilize surfaces that minimize dust accumulation and facilitate cleaning;
- Provide access to all hidden areas to permit inspection;
- Inspect for dust residue in open and hidden areas at regular intervals;
- Clean dust residues at regular intervals;
- Use cleaning methods that do not generate dust clouds if ignition sources are present;
- Only use vacuum cleaners approved for dust collection;
- Locate relief valves away from dust hazard areas; and
- Develop and implement a hazardous dust inspection, testing, housekeeping, and control program (preferably in writing with established frequency and methods).

## About Nilfisk Industrial Vacuums

Nilfisk Industrial Vacuums, also known as Nilfisk-Advance America, Inc., is one of the largest providers of cleaning equipment in North America. From its Morgantown, PA headquarters, Nilfisk Industrial Vacuums supports three brands of industrial vacuum cleaners: Nilfisk, Nilfisk ALTO and Nilfisk CFM. Equipped with exceptionally efficient filtration systems and user-friendly features, the company's vacuums play a critical role in thousands of manufacturing facilities and industrial processes across North America. Supported by a direct sales force and extensive dealer network, Nilfisk Industrial Vacuums have solved a variety of cleaning challenges, including combustible dust, general maintenance, overhead cleaning, abatement, process integration, laboratory/cleanroom control, and more. For more information, visit [www.explosionproof-vacuum.com](http://www.explosionproof-vacuum.com) or [www.foodprocessingvacuum.com](http://www.foodprocessingvacuum.com).

## Nilfisk Industrial Vacuum Division

## References

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- <sup>2</sup> "Combustible Dust National Emphasis Program". 11 Mar 2008. Occupational Health and Safety Association. <[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=DIRECTIVES&p\\_id=3830](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=3830)>.
- <sup>3</sup> "Hazardous Classified Locations". 14 Feb 2007. Occupational Health and Safety Association. <[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_id=9884&p\\_table=STANDARDS](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9884&p_table=STANDARDS)>.
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