

Being proactive is key to mitigating grain dust explosions

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“It hasn’t happened yet.”

It’s a common phrase that we’ve heard many farmers say about safety hazards.

But just because something hasn’t happened yet doesn’t make it any less of a risk.

Grain dust explosions are a prime example. While grain dust explosions, fortunately, don’t happen every day, they are still very much a hazard for grain operations. In fact, grain dust has more combustible power than coal dust.

Even if you can’t recall a particular incident involving a grain dust explosion off the top of your head, there’s no denying the historical track record of destruction these events have caused.

For example, between May and September 1919, there were [four explosions](#) at grain elevators in North America, killing 70 people and injuring more than 60.

You may be thinking, “How could an explosion from more than a century ago still be relevant today?”

While agricultural operations have changed over the past century, with more sophisticated equipment and a greater focus on safety procedures, the causes and consequences of grain dust explosions have remained largely unchanged. That’s because despite the development of prevention reforms, the contributing factors for grain dust explosions – ignition source near confined grain dust, which is highly combustible – remain prevalent in grain processing and handling.

In more recent years, at least 10 people were injured and many killed in January 2014 following an [explosion at a feed plant in Omaha, Nebraska](#), that caused the building to collapse. In May 2017, a [blast at the Didion Milling Company in Cambria, Wisconsin](#), killed five workers and injured 14. And an [August 2018 grain dust explosion in Crystal City, Manitoba](#), thankfully did not result in any fatalities but caused some \$2.5 million in damages and reduced a grain elevator to ash.

So how common are grain dust explosions? More than you may think. Between 1976 and 2011, there were [503 grain elevator explosions](#), resulting in 677 injuries and 184 fatalities in the United States.

While large explosions often make news headlines, smaller ones may go unreported in the media and not be accounted for in statistics. But regardless of the size, any grain dust explosion can cause devastating outcomes, including financial losses, personal injury, and death. After all, any grain handling operation, regardless of size, can be at risk of a grain dust explosion.

What causes a grain dust explosion

Five elements contribute to a grain dust explosion: oxygen, confined space, ignition source, dispersion, and fuel source (grain dust). These elements make up what is known as the “dust

explosion pentagon.” Dispersion means the dust is suspended in air, and confinement refers to dust being in an enclosed space. When grain dust ignites in an open environment, the result is a flash fire, however, when grain dust ignites in a confined or enclosed space, the resulting flash fire will create pressure that will result in an explosion.

When a grain dust explosion happens, the primary blast is often followed by a secondary explosion. The first explosion occurs when dust suspended in a confined space is ignited and explodes. The primary blast will then stir up additional accumulated dust, which then forms a dust cloud and ignites. The secondary explosion is typically larger and much more destructive.

Preventing grain dust explosions

The easiest way to prevent grain dust explosions from happening is by eliminating one of the elements from the dust explosion pentagon. But that’s easier said than done – particularly since oxygen and confinement are always present in grain handling facilities. That’s why it’s imperative to control grain dust levels and ignition sources to prevent these devastating events from occurring.

Some prevention measures include:

- Design work surfaces to minimize the accumulation of grain dust.
- Identify and eliminate any hidden areas where grain dust can gather unnoticed.
- Avoid using brooms and compressed air hoses for cleaning, as they can create more dispersed dust. Only use wet methods or vacuums specifically designed for dust collection.
- Use smooth finishes on ceilings and other surfaces to make cleaning easier.
- Explore options to prevent excessive grain dust accumulation, such as using food-grade mineral oil.
- Only use a dust collection and extraction system designed to control grain dust. Also, ensure the inlet is as close to the grain dust-producing process as possible.
- Keep static electricity under control, which includes bonding and grounding equipment.
- Regularly inspect any equipment that will wear (such as bearings), as they can generate heat and become an ignition source.
- Keep all equipment in good working condition.
- Use appropriate ventilation equipment.
- Locate dust collectors outdoors, where possible.
- Ensure explosion venting is directed away from areas where there may be workers.
- Develop and implement a grain dust inspection and control program that details how often inspections take place and how dust is to be controlled. (The Canadian Occupational Health and Safety Regulations Part II entitled “Permanent Structures” contains requirements pertaining to grain elevators under section 2.14(2) “Housekeeping and Maintenance.” It indicates that dust, dirt, waste, and scrap material in workplaces must be removed as often as is necessary to protect the health and safety of workers.)
- Establish and monitor confined space entry procedures.
- Keep all ignition sources away from dusty areas or use suitable controls.
- Train employees on grain dust hazards, how they can help eliminate the risk of fire and explosion, and how to protect themselves using safe work procedures.

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It's important to keep in mind that because of the environment of grain handling facilities, the hazards associated with combustible dust can never be entirely eliminated. Actively working to manage grain dust and ignition sources can go a long way to mitigating the dangers of grain dust, but it can't be just an occasional undertaking.

Being proactive with routine inspections and control processes for grain dust will help protect you, your workers, and your family.

About the BeGrainSafe Program

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