BILL STEVENSON

# Preventing Dust Explosions

It is quite common to hear, "We don't feel that there is a dust explosion risk at our plant because we have been operating for 20 years and have never had a problem." Yet according to FM Global, the largest industrial insurer, the food processing industry experiences the second largest number of losses compared to all other industrial segments.

FM Global reported 18 losses in the food processing industry, with an average cost of almost $400,000 per claim, in a recent 10-year period and 12 losses with even higher costs in another 10-year period, but these statistics reflect only a small part of the total losses for industry. Getting an accurate picture of the true loss due to dust explosions is extremely difficult because companies often sustain losses that are below deductibles, and in all cases there is a reluctance to go public with what is clearly a negative experience. Public image, litigation, unwanted regulatory scrutiny, fines, and increased insurance costs all inhibit any desire to talk about this subject.

Beyond serious injury or even death, there is the loss of livelihood with forced plant closures, loss of revenue, and costs for reconstruction. The actuarial value used to assess the fiscal consequences for the loss of one life in an industrial accident is $1 million. One Fortune 50 corporate manager told me that the real cost used internally at his company is ten times that value. Clearly, life safety issues go beyond mere dollars, but irrespective of the value placed on life, there is a growing awareness that losses of this kind must be avoided whenever possible. No responsible manager wants to appear uninformed, much less negligent in matters of this gravity.

How should decision makers at a food plant determine if they are at risk? One way is to look at the causes of dust explosions. According to the National Fire Prevention Association (NFPA), mechanical sparks ignited 26.2% of dust explosions in one study and 4.6% in another; smoldering nests 11.3 and 13.6%; mechanical friction 9.0 and 22.7%; electrostatic discharges 8.7 and 0%; fire 7.8 and 9.1%; spontaneous ignition 4.9 and 0%; hot surfaces 4.9 and 9.1%; cutting/welding 4.9 and 6.8%; electrical equipment 2.8 and 15.9%; and unknown or others 19.5 and 18.2%. Is there a modern food processing plant that does not have one or more of these?

Another way is to look at the types of dry bulk ingredients that are being processed. In a broad sense, any organic dust, handled in large quantities, poses a risk. Dusts that have fueled explosions in the food processing industry include milk powder, sugar, starch, fructose, flour, whey, cocoa, and malt. Salt does not burn, but organic-based spices and flavorings can be quite reactive. Some food additives such as threonine are particularly ignition sensitive. If you are unsure, the best thing to do is to have your dusts tested.

FM Global reports that the greatest number of losses in the food processing industry have occurred in bucket elevators, silos, bins, and dust collectors. Other equipment with the potential for significant loss includes drum, fluid-bed, and spray dryers and equipment that imparts a lot of kinetic energy to the product, such as high-speed mills, grinders, blenders, and mixers. Vibrating screeners can be the location for losses if, for example, bonding is lost between the vibrating screen and the stationary housing and the dust has a very low ignition energy, such as fructose and some other food additives.

> Don't ignore the risk. The potential consequences are not in your favor, and the food processing industry has historical loss data to substantiate that statement.

Often, there is little appreciation for the increased risk posed by fugitive dust—dust lying on the floor, on I beams, or other surfaces. In a typical event, a primary explosion occurs inside a vessel that results in breach of the vessel. The escaping pressure wave hits fugitive dust and lifts it up into a cloud. The flame ball that emerges through the breach then ignites the suspended dust cloud in the room, and a secondary explosion ensues. Very likely, this secondary event will be far worse than the initial explosion. If inspection reveals that there is a layer of dust the thickness of a paperclip, you have a problem.

Dust explosions are rare events, but they are highly complex and extremely difficult to predict. If you are handling large quantities of organic dusts, have any of the types of equipment discussed above, and recognize the presence of one or more of the common causes for ignition, then you probably have a risk. Realize, too, that dust explosions are typically over in 100 milliseconds or less. There is no time for people to react, as would be the case in the event of fire. Couple this concern with the sizeable losses commonly reported, and it should be possible to assess your exposure and make an informed decision about the need for professional consultation. If you remain unsure of your situation, then it would be better to err on the side of safety and hire a qualified explosion consultant to evaluate your process, the inherent risks, and potential consequences and make appropriate recommendations.

Don't ignore the risk. The potential consequences are not in your favor, and the food processing industry has historical loss data to substantiate that statement. ●

*Bill Stevenson is General Manager, CV Technology, Inc., 2580 Metro Center Blvd., Suite 1, West Palm Beach, FL 33407.*