Tips

# When to use an explosion suppression system instead of vents

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We all want our plants to be safe from fires and explosions. A common way of ensuring this is providing safeguards for equipment such as dust collectors, dryers, and other equipment that handles combustible material or potentially explosible dusts. Typical safeguards are explosion vents, which release explosion pressure outside the equipment, or explosion suppression systems, which use chemical suppressants to extinguish and isolate a deflagration. But how do you decide whether to use vents or a suppression system? While vents are generally less expensive to install, there are times when they may be impractical, making explosion suppression the preferred safeguard. Here are examples of when to use an explosion suppression system:

***The equipment is located indoors.*** Explosion vents prevent equipment from exploding by quickly rupturing to release explosive pressure outside the equipment. Section 4.8 of the National Fire Protection Association (NFPA) standard *NFPA 68 Standard on Explosion Protection by Deflagration Venting; 2007 Edition*[1] (*NFPA 68–2007*), says that to protect plants, equipment, and people, explosion vents must discharge to the outdoors. This means that ducting from the vents to the outdoors must be used if the equipment is located indoors, which results in much higher $P_{red}$ values (the maximum reduced pressure developed during a vented explosion), requires additional vent area, or in some cases, both. (For detailed information, see *NFPA 68–2007,* sections 7.4 and 8.5.) The ducting can add substantially to your safety costs, depending on the distance from the vented equipment to the plant's exterior walls and on the equipment the ducting must travel around.

***The explosive material has a high $K_{st}$*** (a measurement of pressure rise during an explosion). As the $K_{st}$ value increases, the explosion vent's size must also increase, which increases the vent cost. Changes in the $K_{st}$ value don't affect the cost of an explosion suppression system.

***There isn't enough available area for vents.*** When factors such as $K_{st}$ or vent ducts require large vent areas or the equipment that needs protection simply doesn't have enough physical space for vents, an explosion suppression system is the answer. Because the system has 2- and 4-inch connections, it requires minimal interface area.

***The material is toxic or hazardous and can't be discharged to the atmosphere, as vents would do.*** Materials that are biologically active (such as pharmaceuticals) cannot be safely released into the environment. Moreover, the EPA is likely to continue increasing restrictions on toxic material emissions, all of which can make explosion suppression the right choice for many applications.

***There's no safe place to vent.*** By analyzing the size of an explosion vent and the equipment it vents, you can predict the amount of space around the equipment that an explosion will affect. Sections 7.6.4 and 8.8 of *NFPA 68–2007* list equations for estimating how far flames will extend out from explosion vents. For example, a flame could travel 56 feet (17 meters) out of the explosion vent on a 10-cubic-meter vessel. Most plants don't have this kind of space free of people or equipment.

***Operating conditions exceed* NFPA 68–2007 *design limits.*** Conditions such as operating pressure or equipment size can prevent the use of vents or require significantly larger areas. In many of these situations, suppression can be used to achieve the required protection. **PBE**

## Reference

1. *NFPA 68 Standard on Explosion Protection by Deflagration Venting; 2007 Edition* is available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269; 800-344-3555, fax 617-770-0700 (custserv@nfpa.org, www.nfpa.org).

## For further reading

Find more information on explosion vents and explosion suppression systems in articles listed under "Safety" in *Powder and Bulk Engineering*'s comprehensive article index at www.powderbulk.com and in the December 2006 issue.

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