

Dust explosions are an ever present risk faced by process plants that handle combustible powders or other bulk solids. To minimize this risk and provide plant officials with practical requirements to protect against dust explosions, The National Fire Protection Association, in Aug. 2005, revised its *NFPA 654 – Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids. 2006 Edition.*

The BS&B team frequently meet with powder handling plant officials regarding risk assessment and the choice of explosion protection systems available to suit their individual needs. Through these discussions, we have found considerable interest in the new requirements of NFPA 654 and how this American National Standard affects their plants.

To assist in the understanding of these new requirements, we have compiled this review of frequently asked questions:

Q. What is NFPA 654 and how does it affect my plant?

- A.** NFPA 654: 2006 Edition is the current Best Engineering Practice designed to protect facilities from combustible dust explosions. Combustible dust is any finely divided solid — such as flour, wood dust, or coal dust — that will burn when dispersed in air and ignited. The standard identifies measures to be taken to avoid dust explosions by designing facilities and work practices that prevent the production and spreading of dust as well as controlling ignition sources and provides mitigation recommendations for explosions that cannot be prevented.

NFPA standards are typically adopted by State Fire Marshals, Insurance Companies, and consultants as the reference material for citing best engineering practices. The standard applies to “all phases of the manufacturing, processing, blending, pneumatic conveying, repackaging, and handling of combustible particulate solids or hybrid mixtures, regardless of concentration or particle size, where the materials present a fire or explosion hazard.” (paragraph 1.1.1)



Activation of Explosion Vent by Corn Starch deflagration in 100 cubic meter test vessel

BS&B Solutions for Industrial Explosion Protection:

Suppression ♦ Chemical Isolation ♦ Rapid Response Isolation Valves
Venting ♦ Detection ♦ Quenching ♦ Testing

Q. Who is responsible for implementing NFPA 654 standards at the plant?

A. The owner/operator is responsible for implementing the requirements in this standard, (paragraph 1.1.2).

Q. What explosion protection methods are required by NFPA 654?

A. Various explosion protection methods are permitted. Often combinations of protection measures present the best engineering and financial solution. The most commonly used protection methods are explosion relief venting and explosion suppression. Other methods include containment, oxygen concentration reduction, and dilution of the hazardous material with a non-combustible dust (paragraph 7.1.2).

Q. How do I begin the process protection design to comply with NFPA 654?

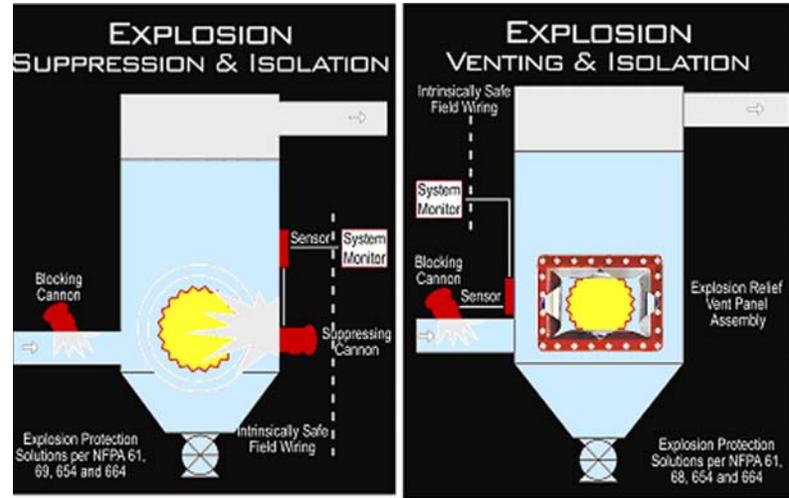
A. The first step is to complete a hazard analysis of the facility and the processes employed. The analysis must include determination of the explosive reactivity (K_{st}) properties of the combustible process material. Records of the process hazard analysis and the protection system(s) employed are to be prepared and maintained for the life of the process.

Q. What process equipment is covered by NFPA 654

A. This standard specifically covers explosion protection for Bulk Storage Enclosures, Pneumatic Conveying Systems, Bucket Elevators, Enclosed Conveyors, Air Separation Devices, Size Reduction Equipment, Mixers, Blenders, and Dryers.

Q. All of my process equipment has deflagration venting installed on it. Is that all I have to do?

A. In most cases venting alone does not provide a sufficient level of protection. Process interconnections must also be protected to prevent explosion propagation. In paragraph 7.1.4.1 NFPA 654 states, "Where an explosion hazard exists, isolation devices shall be provided to prevent deflagration propagation between pieces of equipment connected by ductwork." A deflagration may be transmitted through ducting as small as 3 to 4 inches diameter.



Two Common Methods of Explosion Protection

Q. Does 'return air' to the plant from an air separation device present a danger?

A. Returning air back to the plant from an air separation device is a very common strategy for energy conservation and covered in paragraph 6.1.3 of NFPA 654. These return lines present the danger of exposing plant personnel to the initial deflagration or causing secondary deflagrations within the plant. An explosion isolation device installed on return air lines that reenter the plant prevents such explosion propagation.

Q. Where should I consider the use of building vents?

A. NFPA 654 states, that if a room or building contains a dust explosion hazard...that is external to protected equipment, such areas shall be provided with deflagration venting to a safe outside location. Building vents differ in construction from those used on process equipment. For additional information, please contact BS&B Safety Systems.

We encourage you to obtain your own copy of NFPA 654 direct from NFPA. Their publications can be purchased online at www.nfpa.org.

BS&B Safety Systems, LLC. & IPD manufacture industrial protection technology to meet the requirements of NFPA 654, as well as NFPA documents 68 & 69. Please contact us if your needs include, Material Hazard Analysis, Deflagration Venting, Deflagration Isolation, Deflagration Suppression, or Process Hazard Analysis.



An Explosion Suppression System from BS&B
From left, System Monitor, Triplex Explosion Pressure Sensor, Suppression Cannon and Power Supply.



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