In the fall of 2015, the National Fire Protection Association, NFPA, issued a consensus standard on the management of combustible particulate hazards. This new standard is intended to help facilities understand and apply the various existing standards on this topic and provide a general approach to the management of fire and explosion hazards associated with the manufacturing, handling, and processing of combustible particulate solids. Past dust-explosion events in the chemical process industries have resulted in catastrophic consequences, and the investigation of these events has caused some confusion in the applicability of the various codes and standards that currently exist. The new standard, NFPA 652, Standard on the Fundamentals of Combustible Dust, contains the following intent:
“NFPA 652, Standard on the Fundamentals of Combustible Dust, provides the general requirements for management of combustible dust fire and explosion hazards and directs the user to NFPA’s industry- or commodity-specific standards, as appropriate: NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities; NFPA 484, Standard for Combustible Metals; NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids; NFPA 655, Standard for Prevention of Sulfur Fires and Explosions; and NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities. This new standard establishes the relationship and hierarchy between it and any of the industry- or commodity-specific standards, ensuring that fundamental requirements are addressed consistently across industries, processes, and dust types.”

An important requirement of the new standard is that covered sites that handle and process combustible particulate shall complete a Dust Hazard Analysis, DHA, within three years of the effective date of the standard, September 7, 2015. The first step in the DHA process is described in the flowchart below:

In order to determine the combustible solids hazards, the first requirement is to verify if the powders/dusts handled are indeed combustible or if materials are only handled in closed containers in storage or warehousing activities [such “benign” processing is exempted from NFPA 652 application]. The purpose of testing is to answer several important safety questions. A screening test can be used to determine if small particles of a material will support combustion when suspended in air. Materials that are combustible should be tested to determine the ignition sensitivity and explosion severity. Tests to determine a dust’s ignition sensitivity include the Minimum Ignition Energy, MIE, the Minimum Explosible Concentration, MEC, and the Minimum Ignition Temperature (both dust cloud and layer tests), MIT. These tests will provide an understanding of combustible-dust properties and how easily dust clouds may be ignited. The test to determine a dust’s explosion severity requires suspending the dust in a suitable chamber and igniting the dust cloud with a high energy source. This test provides basic information regarding the resulting explosion including peak chamber pressure and maximum rate of pressure rise. Explosion severity data are required to design explosion protections such as relief venting and allow ranking of a material’s hazard. The next step in the process hazard analysis is to complete the Dust Hazard Analysis and identify areas of the process where materials could form ignitable dust suspensions or dust layers and access ignition sources.
The DHA should classify potentially hazardous dust locations within the facility into one of three categories:
- Not a hazard,
- Possible hazard,
- Fire or explosion hazard

The DHA answers the following key questions for all areas where powders and dusts are handled and processed:
1. Can particulate exist in a size that would allow flame propagation?
2. Is there a mechanism to initiate dust suspension?
3. Could the dust suspension concentration exceed the Minimum Explosible Concentration?
4. Could effective ignition sources exist during 1-3 above?

The DHA report documents the process-materials properties and the operating conditions and, for each potential hazard zone, answers the above four questions and establishes what hazard management methods exist or are appropriate.

**SUMMARY**
Whenever a manufacturing site handles and/or processes combustible particulates, a minimum standard of safety must include consideration of appropriate codes and standards. Codes and Standards represent RAGAGEP, Recommended and Generally Accepted Good Engineering Practices and should always be considered. The new standard on combustible particulate hazards, NFPA 652, includes an expectation that a Dust Hazard Analysis be completed which includes:
• Consideration of dust hazard properties;
• Appropriate hazard expertise and experience of the DHA leader;
• A rigorous review process; and
• Prompt actions to correct identified deficiencies.

DEKRA Insight has a team of highly skilled process safety specialists that provide independent consulting advice on PSM and fire and explosion prevention and protection measures, and safety engineering. We have worked with many clients with regard to these issues and other issues that were identified as a result of OSHA inspections, including informal OSHA conferencing with respect to citations that have been written as a result of inspections. We can assist you in resolving issues and in the citation-abatement process.

ABOUT DEKRA INSIGHT

DEKRA Insight is the global leader in safety at work. We specialize in helping clients evolve both their organizational culture and their operational environment, empowering them to reduce injuries, save lives, protect assets—and in the process, achieve higher performance. Our integrated solutions have been honed over decades and are proven to reduce risk and enhance organizational cultures:

• Safety strategy – Building your roadmap for long-term safety improvement
• Culture & leadership – Building high-performance teams
• Behavioral reliability – Assuring unwavering execution of safety systems and processes
• Governance & capabilities – Providing the framework for safety execution and results
• Safety Resource Optimization – Putting your resources to work for safety
• Management Systems – Developing and aligning the systems that drive safety excellence
• Data Analytics & Metrics – Information and insight that drive results
• Process Safety Lab Testing – Precise data, analysis and tools for process safety decision and action
• Process Safety Engineering – Engineering and advice for process safety excellence everywhere

DEKRA Insight represents the collective expertise of our legacy businesses and partners, each an institution in safety: BST, Chilworth, Optimus Seventh Generation, RCI Safety, RoundTheClock Resources, and Russell Consulting.

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