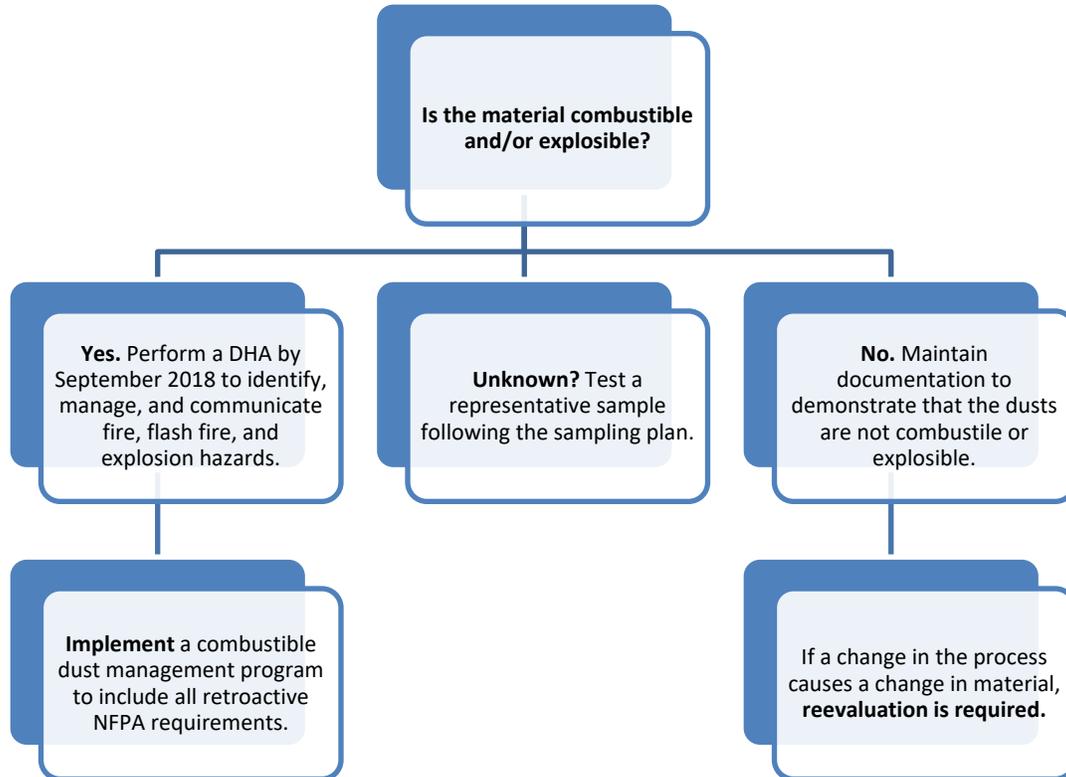


NFPA 652 Explanation and Goals

The National Fire Protection Association (NFPA) issued the first edition of NFPA 652 *Standard on the Fundamentals of Combustible Dust* for 2016. The new standard established the relationship and hierarchy between industry-specific standards NFPA 61, 484, 499, 654, 655, and 664 to ensure that fundamental requirements are consistently addressed across industries, processes, and dust types.

A number of new requirements are being introduced by NFPA 652 that have not previously been included in commodity-specific standards. One of the major changes is that NFPA 652 retroactively requires that a **Dust Hazard Analysis (DHA)** be performed for all operations that generate, process, handle or store combustible dusts or particulate solids. For existing facilities, a DHA must be phased in by the end of September 2018. The standard specifies that the facility owner or operator is responsible for determining if the handled materials are combustible or explosive, and if so, characterizing their properties for the DHA. The following flowchart¹ depicts if a DHA will be required:



Determination of Combustibility and Explosibility

The determination of combustibility and explosibility is based on either of the following:

1. Historic facility data or published data that are representative of current materials and process conditions; or
2. Analysis of representative samples by testing.

NFPA 652 Ties the Current Standards Together

NFPA 652 sits above the industry and commodity-specific NFPA standards to establish minimum requirements for managing explosion and fire hazards of combustible dusts across all industries. The standards that fall under NFPA 652 are:

- NFPA 61, Standard for the Prevention of Fires and Explosions in Agricultural and Food Processing Facilities
- NFPA 484, Standard for Combustible Metals
- NFPA 499, Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Solids
- NFPA 655, Standard for the Prevention of Sulfur Fires and Explosions
- NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

The Dust Hazard Analysis (DHA)

The DHA is required for the owner/operator to document risk, to review existing protection, and to provide a protection plan for dry processes that are determined combustible and explosive. The DHA document must include the following:

- Combustible material data (such as K_{st}, P_{max}, MIE, MEC and MIT)
- Identification of areas where the potential for a dust explosion exist
- Credible ignition sources and dust suspension mechanisms
- Safe operating ranges
- Existing protection methods
- Explosion propagation hazards
- Additional protection recommendations and implementation plan

Where dusts are determined to be combustible or explosible, you must identify and implement the proper controls to address the hazards. The process will need a technical safety basis including equipment protection, controls, and identified safeguards to ensure that future fires and explosions can be prevented or mitigated. The owner/operator of the facility is responsible for identifying and assessing any fire, flash fire, or explosion hazards, which includes performing a DHA, managing the identified hazards, and communicating to affected personnel in accordance with the standard.

If explosible dust is present in your facility, several management systems need to be in place to control this hazard. Implementing a combustible dust management program will include all of the retroactive requirements of NFPA 652 depicted in the table² below:

Owner/Operator General Requirements	Hazard Management Mitigation and Prevention	Management Systems
<ul style="list-style-type: none"> • Determine combustibility and explosibility hazards of materials • Identify and assess any fire, flash fire, and explosion hazards (perform DHA) • Manage identified fire, flash fire, and explosion hazards • Communicate hazards to affected personnel 	<ul style="list-style-type: none"> • Building design • Equipment design • Housekeeping • Ignition source control • Personal Protective Equipment (PPE) • Dust control • Explosion prevention and protection • Fire protection 	<ul style="list-style-type: none"> • Operating procedures and practices • Inspection, testing, and maintenance • Training and hazard awareness • Contractors • Emergency planning and response • Incident investigation • Management of change • Documentation retention • Management systems review

ADF Engineering can assist with your DHA and implementation Plan

ADF Engineering has years of experience with combustible dust risk mitigation designs and dust explosion control, including a variety of suppression and isolation technologies. We can tailor your specific combustible dust needs to the right solution while avoiding excessive and complex overdesigns that would carry significant cost.

References

- Notation 1: *NFPA 652 - Standard on the Fundamentals of Combustible Dust, 2016 Edition. NFPA, Quincy, MA*
- Notation 2: *NFPA 652 Immediate Action Items, 2016, AnnMarie Fauske, Fauske & Associates, LLC*
- Additional: *Understanding NFPA 652 Standard on the Fundamental of Combustible Dust, 2016, BS&B LLC*

About ADF Engineering

ADF Engineering is a leading provider of process and facility engineering solutions. We have a reputation for providing cutting edge, high quality and cost effective engineering solutions to industrial clients throughout the United States, as well as internationally. We understand that every project is unique, therefore, having a strong set of core competencies combined with experience is essential to our success. ADF assembled a sizeable team of extremely talented engineers in all critical engineering disciplines at three strategic U.S. locations. Contact ADF Engineering at (937) 847-2700, or visit us on the web at www.adfengineering.com.

About the Authors

Matt Williamson, P.E., has more than 25 years of process engineering and project management experience. As ADF's Process Department Manager, Matt leads a team of engineers on a variety of process development and improvement projects in the food, feed, bioscience, and consumer products industries. Matt has worked as the lead engineer on a number of challenging projects including combustible dusts, flammable and reactive chemicals, powder and liquid flavors, specialty starches, clean-in-place and sanitization systems, animal feed, lubricant manufacturing, ethanol plant design, algal oils and biodiesel.

David Yung has nearly a decade of hands-on experience in manufacturing processes, with field experience in bioprocessing and plant operations. Since joining ADF, David has worked on multiple projects in the food and nutraceutical industries, serving clients in the U.S. and China. His projects have involved scale-up of new processes developed by technology providers and R&D teams for implementation in large-scale manufacturing facilities.