

Performing Risk Assessments: Dust and Process Safety An ADF Engineering White Paper by Matt Williamson, PE

Background of Safety Risk Assessments

In 1992, OSHA launched Process Safety Management (PSM) to address industries that handle highly hazardous chemicals, under *OSHA Standard 29CFR 1910.119*. This standard seems straightforward but was revolutionary in its impact on process safety improvements across multiple industries where flammable, combustible and toxic chemicals are used in sufficient quantities to pose a hazard to personnel or public safety.

One of the fourteen elements of PSM that has been an indispensible tool in managing chemical hazards is the **Process Hazard Analysis (PHA)**. A PHA is a systematic way to identify the hazards and quantify the risks associated with each particular step of a hazardous process to determine the appropriate level of mitigation and to prioritize those measures. Several methods exist for performing PHA's, including the HAZOP, What-if analysis and LOPA (Layers of Protection Analysis).





In 2008, a major sugar processing facility exploded in Savannah, GA, killing 14 people. The cause of this explosion was the accumulation and mishandling of combustible dusts. This event, although not the first, or even largest, of its kind, drew enough attention to trigger OSHA into establishing a new National Emphasis Program for combustible dusts. OSHA looked to the existing expertise at the National Fire Protection Agency (NFPA) to develop a new standard for mitigating combustible dusts across all industries.

This new standard, NFPA 652, was issued in September 2015. It borrowed many elements from the successful PSM program, including a requirement for a combustible dust risk assessment based on the concept of the PHA.

A number of new requirements were introduced by NFPA 652 that had not previously been

included in commodity-specific standards. One of the major changes is that NFPA 652 retroactively requires a **Dust Hazard Analysis (DHA)** be performed for all operations which generate, process, handle or store combustible dusts or particulate solids. For existing facilities, a DHA must be completed by the end of September 2020. Each facility owner or operator is responsible for determining if the handled materials are combustible, and if so, characterizing their properties for the DHA.

Differences between a DHA and a PHA

While a PHA may cover a wide range of potential chemical hazards, such as fires, explosions or toxic chemical exposure over an endless variety of hazardous chemicals with different properties and risks, a DHA is very specific to combustible dust explosion risks. In a PHA, an overall risk score will be developed based on the multiple criteria of severity, likelihood and detectability. However, in a DHA, both the severity and detectability scores tend to wash out as identical for most scenarios, so likelihood is the only practical criteria that remains. This must be carefully determined during the DHA by examining the potential presence of each component of the combustible dust pentagon – oxygen, fuel, ignition source, containment and dispersion.

ADF Engineering has decades of risk assessment experience

Recently, ADF was entrusted by a major Fortune 500[™] client to perform risk assessments at multiple sites to determine the appropriate level and form of mitigation for combustible dusts in large banks of concrete corn silos. Utilizing PHA-Pro software, ADF determined that isolation from all potential ignition sources, particularly bucket elevators, keeping the corn dry to avoid heat from degradation and a quick turnover of the stored corn were the key to preventing a dust explosion in these silos, where explosion protection is impractical to impossible.

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

While many commercially available software packages exist for performing PHA's, including PHA-Pro and PHA-Works, no equivalent is currently available for DHA's. At ADF Engineering, we have developed our own DHA program and have PHA-Pro licensed for PHA development.

References

- NFPA 652 Standard on the Fundamentals of Combustible Dust
- OSHA 29CFR 1910.119 Process Safety Management

About ADF Engineering

ADF Engineering is a leading provider of process and facility engineering solutions for the food, feed, fuel, and bioscience industries. We have a reputation for providing cutting edge, high

quality and cost effective engineering solutions to industrial clients throughout the United States and Canada, as well as, across the globe. We understand that every project is unique. Therefore, having a strong set of core competencies combined with experience is essential to our success. ADF has assembled a sizeable team of extremely talented engineers in all critical engineering disciplines at two strategic U.S. locations. Contact ADF Engineering at (937) 847-2700 or visit us on the web at <u>www.adfengineering.com</u>.

About the Author

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