DUST EXPLOSION CODES AND STANDARDS:

Ensuring Regional Compliance and Global Consistency

DEKRA

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INTRODUCTION

Multinational organizations face an ever-growing list of regional regulations their sites must comply with across the world. Operating consistently as a multinational company across these various regulatory regimes can be a potential minefield for even the most experienced of safety professional, and ensuring each site meets different standards can be difficult to coordinate and monitor.

A hot topic within the process industries in recent months has been the introduction of the new NFPA 652, Standard on the Fundamentals of Combustible Dust, in the United States of America. Whilst the European ATEX Directives have no direct jurisdiction in America, and NFPA 652 in Europe, it is critical to understand the features and requirements of both to ensure that corporate initiatives in the combustible dust area ensure compliance with each.

In this e-book, we will look at the new NFPA 652 standard in a little more detail, and help compare it to the European ATEX directive; highlighting the main similarities and differences and how it may affect your sites and global internal compliance programs.

WHY ARE DUST THREATS SO SERIOUS?

In our homes, dust tends to be regarded as an annoyance rather than a serious hazard. However, on an industrial scale, dust becomes far more of a safety issue. Even a small quantity of dust can give rise to explosive conditions, with unrecognized ignition sources often rife in factories and plants. Globally, there are numerous regulations on how to deal with the threat dusts can pose, so ensuring compliance is essential to mitigate the likelihood and / or consequence of explosion.

KEY POINTS – NFPA 652

NFPA 652 states that 'a facility owner or operator is accountable for the safety of the building and its occupants when the potential for combustible dust is present.' NFPA 652 outlines the key areas that have to be addressed and managed in a facility with potentially combustible dust, including:

- ESTABLISHING WHETHER OR NOT THE DUST(S) IS COMBUSTIBLE
- ASSESSING FIRE, FLASH FIRE, AND EXPLOSION HAZARDS
- PREVENTING AND MITIGATING FIRE, FLASH FIRE, AND EXPLOSION HAZARDS
- SETTING UP SAFETY MANAGEMENT SYSTEMS

Key Points: NFPA 652

The US regulatory system is considerably more complex than that pertaining to the EU; the biggest being local and state governments have the ability to adopt fire/building code standards and regulations. This subsequently renders 652 mandatory.

The objective of NFPA 652 is life safety, mission continuity and mitigation of fire spread and explosions.

- To comply with the requirements of NFPA 652, the owner/operator of facilities with potentially combustible dust shall be responsible for:
- Determining combustibility and explosibility hazards of materials (Chapter 5)
- Conducting a Dust Hazard Analysis (DHA) - Identifying and assessing fire, flash fire, and explosion hazards (Chapter 7)
- Managing identified fire, flash fire, and explosion hazards
  - Prescriptive Approach (Chapters 5, 7, 8, 9)
  - It shall be permitted to use performance-based alternative designs for a building, equipment, ignition source control, and explosion protection in lieu of prescriptive requirements in Chapter 8 (Chapter 6)
- Establishing Safety Management Systems (Chapter 9)

KEY POINTS – ATEX

Across Europe there are two European Directives for controlling explosive atmospheres with which operators in member state countries need to comply:

1. Directive 99/92/EC (also known as 'ATEX 137' or the 'ATEX Workplace Directive') on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres.
2. Directive 94/9/EC (also known as 'ATEX 95' or 'the ATEX Equipment Directive') on the approximation of the laws of Members States concerning equipment and protective systems intended for use in potentially explosive atmospheres.

Alongside this, the UK has DSEAR regulations, which is the UK regulation adopting ATEX (and hence meets the general principles of ATEX).

In the ATEX Directives, the following definition is given to explosive atmospheres:

> Mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapors, mists or dusts in which, after an ignition has occurred, combustion spreads to the entire unburned mixture (Directive 94/9/EC (ATEX 95 or 100a), article 1.3 / Directive 1999/92/EC (ATEX 137 or 118a), article 2)

"Atmospheric conditions" are not defined in the ATEX Directives, but generally typically interpreted to be:

> Pressure from 0.8 to 1.1 bar absolute
> Temperature from -20 to +60 C
> Oxygen content about 21% by volume

This is key; NFPA prescribes the atmospheric conditions; ATEX is based upon general reliance by organizations to interpret the 'general understanding'.

Key Points: ATEX

As previously mentioned, there are two parts to ATEX, with ATEX 95;

- Applying to equipment and protective systems intended for use in potentially explosive atmospheres
- Safety devices, controlling devices and regulating devices outside explosive atmospheres can be covered as well
- Any equipment conforming to ATEX 95 must be allowed on the market in the EU

With regards to ATEX 137, there are a number of obligations placed upon employers, in order of priority;

- to prevent the formation of explosive atmospheres, or where the nature of the activity does not allow that,
- to avoid the ignition of explosive atmospheres, and
- mitigate the detrimental effects of an explosion so as to ensure the health and safety of workers

Where necessary, these measures shall be combined and/or supplemented with measures to prevent the propagation of explosions.

Regarding explosion risk assessment, employers must assess the specific risks from explosive atmospheres, taking account at least of;

- the likelihood that explosive atmospheres will occur and their persistence
- the likelihood that ignition sources, including electrostatic discharges, will be present and become active and effective
- the installations, substances used, processes and their possible interactions
- the scale of the anticipated effects

Key Points: ATEX

The explosion risks shall be assessed overall - places which are or can be connected via openings to places in which explosive atmospheres may be present shall be taken into account (ATEX 137, article 4).

Hazardous Area Classification is a further area appraised in ATEX 137, requiring that areas where explosive atmospheres may occur are classified as hazardous. This applies where an explosive atmosphere may occur in such quantities as to require special precautions to protect the health and safety of the workers concerned. A place in which an explosive atmosphere is not expected to be present in such quantities as to require special precautions is deemed to be non-hazardous. The requirement for HAC is not linked to the presence of electrical or other equipment; or the presence of people and HAC applies outside and inside equipment.

All hazardous areas (zones) to be classified on the basis of the frequency and duration of an explosive atmosphere. For gases and vapors Zone 0, 1 and 2 are used.

New definitions for dusts:

- Zone 20: (almost) continuous
- Zone 21: likely in normal operation occasionally
- Zone 22: unlikely in normal operation and only for short periods

(ATEX 137, article 7 and Annex I).

WHAT DO YOU NEED TO NOTE?

Both NFPA and ATEX standards deal with explosive atmospheres, but there are several key differences that operators need to be aware of when ensuring compliance across sites globally. There is inevitably strong overlap between the two, including;

- Stance on flammable/combustible dusts;
- Evaluate the risk, keep under control, document the risks.

One of the key points to note is that NFPA is a non-governmental organization whose recommended best practices can be adapted by “Authority Having Jurisdiction (AHJ)” such as local/state fire departments as well as OSHA at a Federal level. ATEX, on the other hand, is part of EU law; all European sites must comply to ensure they are not breaking the law. Obviously, compliance with best industry practices is generally recommended, with any independent process safety contractor being able to help you get all sites globally up to code.

Another point to note is that ATEX is more wide-reaching than NFPA 652. This US standard is specifically related to dust explosions, with a number of other standards covering other aspects of process safety. Dust explosion protection is just one aspect of ATEX, with the two sections covering a range of workplace and equipment safety measures.

> "Broadly speaking, NFPA 652 is similar to ATEX requirements but its focus is dust explosion matters"

CONCLUSION:

It's tough to comprehensively summarize everything about ATEX and NFPA 652, as there are plenty of additional rules, regulations and factors that affect them both. Broadly speaking, NFPA 652 is similar to ATEX requirements but its focus is dust explosion matters. It also covers assets explicitly, giving quantitative criteria which ATEX does not address.

ATEX's compulsory Explosion Protection Document (EPD) effectively covers most of what the NFPA 652 standard requires, therefore providing a similarity that can be applied across international borders.

To summarize, there are 4 key points operators should note when it comes to dust explosions regardless of the standards and regulations that cover your operations;

1. Having appropriate data on combustibility, explosivity, thermal instability, and electrostatic properties
2. Assessing fire, flash fire, and explosion hazards
3. Preventing and mitigating fire, flash fire, and explosion hazards including effective housekeeping practices, bonding and grounding, explosion protection and isolation
4. Setting up safety Management Systems including management of change (MOC), mechanical integrity, and the all-important operator training.

DEKRA Process Safety

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We have offices throughout North America, Europe, and Asia.
For more information, visit www.dekra-process-safety.com
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Do you want to learn more about dust explosion codes and standards?
Contact us – we will be happy to assist you!

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