

ISO/IEC 80079-20-2: EXPLOSIVE ATMOSPHERES, PART 20-2: MATERIAL CHARACTERISTICS

YOUR PROCESS SAFETY PARTNER OF CHOICE

- Dust, gas and vapour flammability testing
- Chemical process hazard analysis
- Process safety consultancy
- Hazard & risk awareness training



Sigma-HSE

Sigma-HSE's engineers and laboratory technical staff have years of experience in the field of process safety. We provide consultancy, testing and training solutions that enable manufacturing plants to operate safely and meet regulatory compliance.

Summary

The European Chemicals Agency (ECHA) has amended and recently enforced Annex II of REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) regarding the compilation of Safety Data Sheets (SDS). EU REACH regulations, which have been in place since 2007, have required suppliers and manufacturers of chemical substances to provide SDSs.

The amendment to Annex II of REACH came into effect on the 1st of January 2021, meaning that all new SDSs that are issued from this date must adhere to new requirements. There is, however, a two-year grace period whereby all existing SDSs will continue to be valid. After the grace period, all SDSs will have to be updated following new requirements.

The amendment to Annex II has the potential to disrupt both suppliers and producers of chemicals for the foreseeable future, so companies need to ensure that they understand and comply with this legislative change as soon as possible.

What is an SDS?

Safety Data Sheets (SDSs) are synopsis documents that provide information about potential health and safety hazards and the physiochemical properties of a material. SDSs also provide information and advice on safely storing, handling and disposing of that material. The requirements apply to a range of substances including pure substances, mixtures and preparations, intermediates, and wastes etc.

An SDS is usually written by the manufacturer or supplier of the material. But, in some cases, an employer may be required to prepare an SDS. An example of this is when a particular product is produced and used in a singular workplace.

The information used to identify the hazards of materials used in the workplace will help protect the workplace, employees and the environment from potential near misses and catastrophic incidents.

The details provided in an SDS will also inform workers on how to safely use, handle and store the material. They also allow companies to take a more holistic approach to their process safety practices by indicating what necessary emergency measures should be put in place. SDSs are important resources that each workplace should utilise in their processes.

Introduction

The avoidance of ignition sources is one of the most common measures for the protection against dust and powder explosions. Although there is a high probability that dust explosions may potentially occur when combined with the presence of another potentially hazardous chemical, dust explosion hazards are not classified as a characteristic under REACH. Previously, in the Material Safety Data Sheet (Chapter 2.3 of Annex II), dust explosion hazards were simply cited as 'may form explosible dust-air mixture if dispersed'.

Although the above statement may be considered sufficient, it does not allude to the potential that a dust may have as an explosive hazard. Moreover, it does not consider the associated risks concerning the material. As a result, the first question that should be asked is, is my material a combustible dust?

To answer the above question, 'combustible dust' must first be defined. Most materials capable of being oxidised can combust, so most organic materials will be capable of combustion.

The propensity for this combustion/oxidation reaction is related to the particle size of the solid particles. The HSE state that 'a dust explosion involves the rapid combustion of dust particles that releases energy and usually generates gaseous reaction products.' Generally, powders that have an average particle size distribution below 500 micrometres are usually capable of propagating combustion. However, if a material with an above average particle size distribution contains 'fines' that have been created during operations, they can suspend in the air for an extended period of time.

Therefore, distribution, rather than particle size, should be investigated in a risk assessment. Undertaking a range of suitable dust and powder tests are therefore necessary to both determine and confirm combustibility in a work environment.

ISO/IEC 80079-20-2: Explosive atmospheres – Combustible dusts test methods

ISO/IEC 80079-20-2:2016 is a detailed dual logo standard that assess whether a dust sample or a layer of dust can form a flammable atmosphere or combust. ISO/IEC 80079-20-2:2016 also permits the classification of areas where such materials exist. Classification is necessary for the selection and installation of operational equipment for use in the confirmed presence of any combustible dust atmosphere.

Testing methodologies attempt to ignite a material as a dust cloud using a range of ignition sources. such as chemical igniters, electrical sparks and heated wires and coils. If the material ignites then it can potentially pose a risk in atmospheric conditions.

If the material can form a flammable atmosphere, then how should that potential risk then be assessed against current or future processes?

By using Hazardous Area Classifications (HAC) alongside the control of ignition sources, a range of tests including minimum ignition energy (MIE), minimum ignition temperature (MIT) and layer ignition temperature (LIT) can help create a foundation by which to establish a basis of safety.

An SDS is usually an excellent aid during this phase as it can provide information on the properties of materials that can create dust explosions.

REACH and SDS

The amendment to Annex II, known as the Commission Regulation (EU) 2020/878 came into effect on the 1st of January 2021, meaning that all new SDSs, issued from this date, must adhere to new requirements.

There is a two-year grace period whereby all existing SDSs will continue to be valid. After the grace period, all SDSs will have to be updated following the new requirements.

However, there may be an area of some potential flexibility with these changes as the new requirements are not necessarily required in a specific work environment. Examples include the separation of particle size, in processes such as milling, which may have the potential to modify explosion sensitivity and severity.

The new revision will also require the inclusion of Unique Formula Identifiers (UFI), the documentation of additional information on nanomaterials, additional information for substances and mixtures with endocrine-disrupting properties and the addition of Specific Concentration Limits (SCLs) M-factors and Acute Toxicity Estimates. Finally, some other properties that may be listed on the updated SDSs may not be supportive of a given basis of safety.

About Sigma-HSE

At Sigma-HSE we're able to provide a range of solutions to aid in the compilation of your Safety Data Sheets.

Working to ISO/IEC 17025 standards, our global laboratories generate data on the flammability, explosivity and thermal reactivity of your dusts, gases, vapours and substances. Our team of technical experts have years of experience testing, analysing and recommending practical safety solutions for your business.

Sigma-HSE is happy to offer free advice and guidance regarding the new EU Safety Data Sheet regulations for new and existing powdered products.

Process Safety Laboratory Testing Services

ISO/IEC 17025 Accredited

Sigma-HSE provides accurate test data that can determine whether a material is flammable or chemically reactive. Test data is required to ensure that a risk assessment can be performed. Typical test data include:

Fire & Explosion Properties

Dust and Powder

- Determination as to flammable or not.
- Minimum Ignition Energy (MIE)
- Minimum Ignition Temperature (MIT)
- Layer Ignition Temperature (LIT)
- Explosion Severity, P_{max}, K_{st} and St Class
- Minimum Explosive Concentration (MEC)
- Limiting Oxygen Concentration (LOC)
- Thermal decomposition for the safe drying of powder
- Burning Behaviour

Gases and Vapours

- Flash Point
- Auto-Ignition Temperature (AIT)
- Flammable Limits (LEL & UEL)
- Heat of Combustion

Electrostatic Hazards

Electrostatic charge build-up, accumulation and discharge can result in a variety of concerns from personnel receiving static shocks to spark discharges that can ignite a dust or vapour cloud, resulting in loss of equipment, manufacturing downtime, injury or even fatality. Sigma-HSE can carry out electrostatic assessments and provide test data. Services include:

- Powder Volume / Surface Resistivity
- Charge Relaxation Time for powders, bags (IBC, FIBC), liners etc.
- Volume and Surface Resistivity for bags, liners, gloves etc.
- Liquid Conductivity
- On-site electrostatics testing of pipework, flooring, Operators (PPE), etc

Chemical Reaction Hazards Testing

Many industrial processes involve the mixing and blending of materials/chemicals whereby the reactions can often produce exothermic energy that has the risk of becoming a runaway reaction unless appropriate dosing and cooling controls are in place. Sigma-HSE can provide scale-up and DIERS calculations to ensure your process remains safe or in the event of a runaway reaction, the effects are mitigated. Tests available include:

- Adiabatic Calorimetry (VSP2)
- Heat Flow Calorimetry (Mettler RC1)
- Isothermal Calorimetry (Mettler RC1)
- Reaction Calorimetry (Mettler RC1)
- Small Scale Screening Tests (DSC, ARC, Carius Tube, VSP, etc.)

Our Solutions

Testing Solutions

Working to ISO/IEC 17025 standards, our laboratories generate test data on the flammability, explosivity and thermal reactivity of dusts, gases, vapours and substances.

Consultancy Solutions

Our global consultants provide a wide range of specialist technical safety services including Process Safety Management, DSEAR/ATEX, HAZOP, HAC, Vent Sizing, Chemical Reaction Evaluation and incident investigation.

Training Solutions

We provide bespoke workshops, open seminars and tailored in-company events for businesses of all sizes and can be tailored to different skill levels from operational staff to directors looking for insight into corporate safety culture.

Further Reading

<https://www.tuvsud.com/en-gb/country/switzerland/resource-center/reach-atex-and-dsc>

<https://www.iso.org/standard/66564.html>

<https://www.hse.gov.uk/pubns/priced/hsg103.pdf>

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<https://www.iso.org/standard/66564.html>

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