STS

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Fire protection systems

for the protection of

- Filter and dust extraction systems

Risks

The extraction of solid materials and smoke / welding gases is associated with certain dangers. These risks must be recognised and already taken into account in the planning stage of the systems.

The risks result from combustible dusts and remains of treatments. The danger of fire and explosion in separators and filters count amongst the important risks that are not to be underestimated. The materials to be removed are fed to the filters through pipelines. Hot or glowing residues as well as atypical extracted material such as cigarettes or other glowing parts, for example, can get into these pipelines. Under certain circumstances these “energy carriers” can trigger a fire in a filter or its waste container. Very fine dust can oxidise very quickly in the air through friction and thereby trigger a fire.

Mixtures of metal dust and additives can lead to “hybrid mixtures”, some of which exhibit relatively low ignition temperatures. Exothermal reactions can trigger a fire without the initial ignition being brought in through the thermal energy carrier.

The following three factors are essential prerequisites for a fire or an explosion in a filter system:

- FLAMMABLE MATERIAL
  in the form of combustible slag and dust with an especially high concentration in the area of the filter and containers.
  Formation of gas (special form of flammable material)
  Combustible gases, so-called low-temperature carbonisation gases, can be created through smouldering fires. These low-temperature carbonisation gases can ignite when the filter is opened and through the related intake of oxygen. This can lead to deflagrations.
- AIR (Oxygen O_2)
  fed through the ventilator
- IGNITION ENERGY
  constitutes hot parts and/or reactions in waste containers and the static discharge of poorly grounded or non-grounded parts of the system.

Evaluation

Considering the presence of all three factors, technical safety installations to protect people and the system are required.

In this connection, a fire should be detected in the creation phase and fought quickly and as close to the source of the fire as possible through the targeted use of suitable extinguishing agents.

Protection concept

Equipping filters with automatic object protection extinguishing systems offers maximum protection for systems, people and buildings.

In this respect, a distinction is made between which fire load and danger is present as well as the possible damage that can occur. Naturally, the economical aspect should not be neglected.

As **basic equipment** in the case of filter systems in which there is a risk of fire, at least an automatic extinguishing system should be available as a minimum. During standstill of the system, this must guarantee fire protection through temperature monitoring. Furthermore, it must be possible to activate such an extinguishing system manually at any time.

In the case of systems that work “unmanned”, in which a fire is very difficult to detect or for systems that are extremely important for production, **early fire detection** is indispensible.

Serious damage to filter systems can be avoided through rapid detection of fires and the use of suitable extinguishing agents. In this way, downtimes of production systems can be avoided and/or reduced to a minimum.

STANDARDS

- VDI 2263 Sheet 6
- EN19353:2019-06

The spreading of fire and thereby secondary damage to systems, buildings and the environment can be avoided through the rapid and targeted use of extinguishing agents.

Low quantities of extinguishing agents guarantee that people are not endangered by the extinguishing agent.

In contrast to room protection systems, e.g. sprinkler systems that protect entire manufacturing halls and prevent the spreading of a fire to other parts of the building or systems, object protection systems can be implemented on a relatively low scale. The fire detection components of room protection systems address the fire variables at a significantly later stage. This circumstance results in the fact that damage to systems that are protected only by room protection systems is substantially greater, and can even lead to total loss of individual systems.

The extinguishing agent used in object protection can flow directly into the filter room and thereby be essentially more effective than the extinguishing agent of room protection systems in which the object to be protected can only “be reached from the outside”.

The use of several object protection extinguishing systems that are engaged specifically at the source of danger is therefore to be preferred and/or seen as a complement to a larger, significantly less effective and more cost-intensive room protection system.

A spark extinguishing system can be installed as a preventive measure in systems where the frequent entry of hot parts from the process is to be expected, but it cannot dispense with an extinguishing system for the previously-described reasons.

Extinguishing Systems

Fire detection

The fire early detection system detects fires in the development stage. In this respect, maximum temperature detectors ❺ are used in the raw gas area. Optionally, an IR spark detector ❶ can also be installed in the raw gas intake for the detection of hot or glowing parts. Hereby, detectors can be deployed in different detection areas, depending on the materials deposited. By deploying this early detection, a fire in the system can be prevented already before it occurs, by preventive triggering of the extinguishing system.

If a source of fire is to be expected in a waste container, this can also be monitored through temperature detectors ❾.

The fire detection system in the clean gas area is selected on the basis of quality and properties of the filter elements. Smoke detectors ❸, IR spark detectors ❹ as well as maximum temperature detectors ❷ are available for this purpose. The smoke detectors address pyrolysis gas, a typical combustion product at the start of a smouldering fire.

Naturally, other fire detection components are possible for special cases.

The extinguishing system can also be triggered manually before an automatic fire detector reacts.

The previously described possibilities must be applied specifically to systems and correspond to the course of the fire that is to be expected. Upon detection of a fire variable or actuation of the manual release button ❼, the extinguishing system is activated ❻, the personnel alarmed and the extraction system switched off ❽.

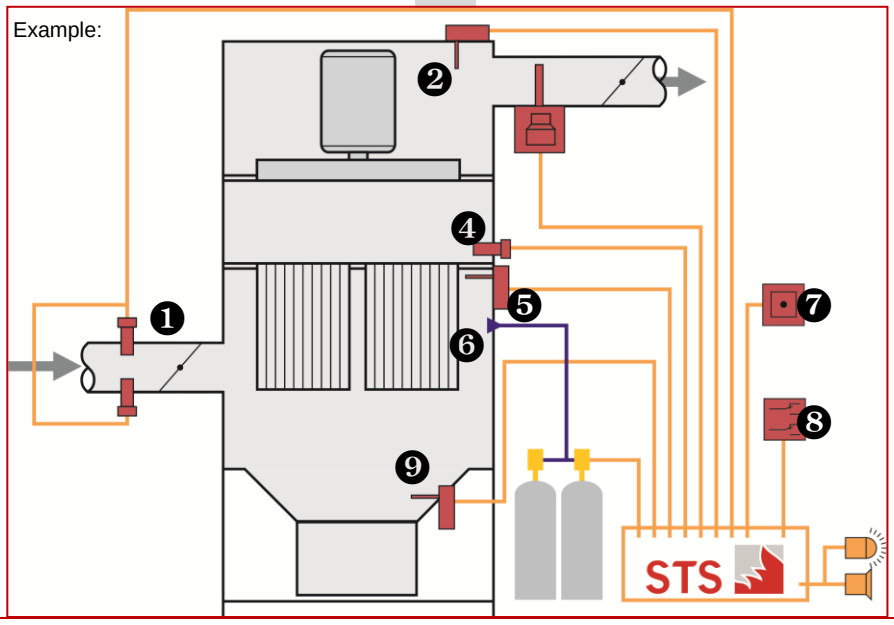
Control

The processing of the incoming signals and messages is performed in the control centre. The control centre monitors the connected warning and triggering devices. The alarm units and locking functions are also controlled.

The reaction of a fire detector leads to the immediate switch-off of the filter system and, depending on the type of system, to the immediate or delayed triggering of the extinguishing system.

A fault message from the extinguishing system can also be processed and, depending on the requirement, also lead to the switch-off of the system.

Example:



Extinguishing

Depending on filter type, filter medium as well as material to be deposited in each case, various extinguishing agents and extinguishing procedures can be necessary.

In general, the following extinguishing agents are available for this purpose:

To be used preferably:

- CO_2 for fires that do not lead to deep-seated glowing fires and/or which can be extinguished manually. In the case of deep-seated fires, which can arise especially in cartridge filters or in waste containers, a flooding with extinguishing agent to maintain the extinguishing level and lengthy impact of the device with CO_2 will be necessary. The extinguishing principle consists of the displacement of oxygen and the cooling effect of CO_2.

To be used conditionally:

- Argon
- Metal fire – extinguishing powder for systems which contain materials such as alkaline earth metals like aluminium or magnesium as a supplement to inert gas extinguishing systems.

The usability of the extinguishing agent must be checked in the individual case. In so doing, any possible repercussions to the upstream processes and machines must be taken into account.

Personal protection measures must be taken with CO_2 extinguishing systems if the quantity of CO_2 applied should exceed 5 Vol.% of the surrounding space. (ZH1/206)

If CO_2 is used as the extinguishing agent, it is fed to the extinguishing line nozzle(s) of the filter in the raw gas area through high pressure steel lines and/or hose lines. Liquid CO_2 is fed into the nozzles in the raw gas area. The CO_2 is aerolised there in the liquid phase and then vaporised quickly, thereby forming a large volume of gas, which is introduced into the raw gas area under relatively low pressure. In this way, swirling of the deposited dust is avoided. The extinguishing nozzles across from the raw gas area are closed with protective caps so that dirtying of the extinguishing agent nozzles is prevented.

Conclusion

STS object protection extinguishing systems protect people, systems and machines quickly and effectively and thereby prevent damage and downtimes which no company can afford these days.

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