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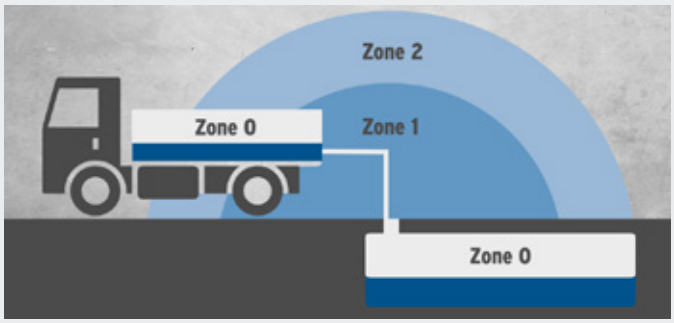
Explosion protection in hazardous material storage technology

Explosion protection plays an especially important role in hazardous substance storage technology, which should not be underestimated. The European Union ATEX equipment directive and ATEX workplace directive should ideally be directly applied to the development of new products. Operators and manufacturers both have wide-ranging duties.

How can explosions be prevented?

The trigger for an explosion is the interaction between oxygen, a combustible substance and an ignition source. The mixture ratio between oxygen and the combustible substance is the most important. An exception to this is a dust explosion, where it comes down to the distribution of the dust. The prerequisite for an explosion is a suitable concentration of the substance. Depending on the substance in question, this must be between the lower and upper explosion limits. If the lower explosion limit is not reached, there is too low a concentration of the substance present, and no explosive atmosphere can be formed. If the environment is saturated by the combustible substance, the upper explosion limit is reached and therefore the oxygen content is too low to allow an explosion to take place. To prevent an explosion then, you must ensure that either the mixture ratio of oxygen to combustible substance is not suitable or that there is no source of ignition.



Ex Zones and their classification

The environment around the combustible substance is divided into three different zones, both spatially and in terms of time, taking into consideration any outgassing. To clarify, consider the example of a tanker with a petrol mixture on board. Inside the tank, above the surface of the liquid is the highest concentration explosive atmosphere. Here it's Zone 0. When the tank is unloaded, the direct vicinity of the pumping nozzle, or hose connection, is Zone 1. In this zone, the likelihood of a dangerous explosive atmosphere being created is lower. As the distance from the pumping nozzle increases, the concentration of the substance and also the likelihood of an explosive atmosphere being created gets smaller, so this is classified as Zone 2. Depending on the zone, various safety precautions must be taken to prevent explosions.

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Duties of operators and manufacturers

An operator is responsible for improving work health and safety for employees, who may be at risk due to explosive atmospheres. The ATEX workplace directive 1999/92/EC are the guidelines to follow here. Thereafter, the following points must be ensured:

1. Avoidance or limitation of the formation of explosive atmospheres
2. Avoidance of effective sources of ignition
3. Limitation of the effects of any explosion to a harmless level

The sequence of measures in this case is the same as their priority. In addition, the operator must also produce an explosion protection document, in which zone classification must be carried out, amongst other tasks. This is specified in the regulations for industrial health and safety. Only the operator can know the precise details of the environment and can evaluate the interaction of the various machines, operations carried out by personnel etc. The explosion protection document is an important part of the risk assessment and is therefore a significant part of works health and safety management.

On the other hand, a manufacturer of products for use in areas with an explosive atmosphere is obliged to safely develop and market these products accordingly. This is regulated by the ATEX equipment directive 2014/34/EU which came into force to harmonise national regulations within the EU. Caution is required as products with a potential source of ignition need to be marked.
It is important that the manufacturer evaluates and then stipulates in which zone the product may be used. The operator must then specify this accordingly in his explosion protection document and zone classification.

For more information or to speak to one of our technical consultants, please call

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