Statement on Lightning Protection for Biogas Plants

In the following segment, we summarize the facts regarding the great uncertainty about implementing proper lightning protection for biogas plants.

First, the German Technical Rules for Operating Safety TRBS 2152-3 determined lightning as a source of ignition in an explosive atmosphere. This may occur through direct impact, as well as through overheating on the path of the flash discharge. Excess voltage or the high energy density of a lightning strike in vicinity of the system can cause strong currents to spark or trigger fire.

Therefore, protective measures are necessary to prevent a direct impact in a potentially explosive situation, and the discharge paths of a flash must be designed in such a way that heating or sparks do not become a source of ignition.

The German building law specifically requires effective lightning protection for structures in which lightning can "easily occur" (such as high chimneys, church towers, skyscrapers or exposed buildings) and where a lightning strike could lead to serious consequences. In addition to many other construction facilities, biogas plants are listed in the German Special Construction Regulation (SBauVO).

What is meant by lightning protection?

There is external lightning protection, usually composed of intercepting devices intended to receive and direct the lightning strikes to the ground. Such lightning arresters are the visible devices and commonly understood under lightning protection.

But much more important and mandatory is the **internal lightning protection**; it is comprised of adequate grounding and equipotential bonding of all metal installations inside and outside of conductive structures. For example, all steel or stainless steel pipes, all podiums, ladders or railings made of steel, on the fermenter mounted over-/underpressure protection units and their blow-off pipes made of steel, etc.
The proper external grounding of conductive parts within the system can also be seen as part of the external lightning protection.

Equipotential bonding and ground connection must be installed in accordance with DIN EN 62305-3 (VDE 0185-305-3), as well as with DIN VDE 0100-410 and DIN VDE 0100-540. The proper function, such as the contact resistance, must also be periodically checked and measured by a competent agency.

Equally important and **obligatory is an overvoltage protection**. Above all, vital and safety-related plant components, such as the plant control and PMC devices must be protected against destruction or failure.

Specialized suppliers offer suitable protective devices, from their use at normal conditions up to ATEX approved devices to be used in explosive areas. The installation as well as the construction of the grounding and equipotential bonding must be carried out by a specialized company and documented accordingly.

Deciding on the appropriate lightning protection measures for a specific location is of utmost importance. The process should not be taken lightly.

As previously stated, the internal lightning protection and overvoltage protection are always required.

Each plant should have its own external lightning protection system (Interception system), determined on a case-by-case basis. The DIN EN 62305 stipulates how a lightning protection risk analysis should be carried out and how a lightning protection concept should be created.

Regardless of all previously cited standards and regulations for the execution of lightning protection, meeting the German Industrial Safety Ordinance (BetrSichV) is legally required for the operation of a system requiring monitoring in any biogas plant.

The **§4 BetrSichV** states the following **basic obligations** for the employer.

(1)Work equipment and tools may be used only if the employer:

1. has carried out a risk assessment,
2. has established the identified protective measures according to the state of the art, and
3. has determined that the use of the equipment is safe according to the state of the art.

To reference the state of the art, we want to cite technical information from the "Requirements for lightning protection in biogas plants" from the expert group SVK Biogas, dated 30.04.2014.

Among other things, the No. 4.1 “External lightning protection, findings from Practice, 2.” declares that "catch and discharge devices should be not located directly on top of containers in close proximity to risk delimited zones or fire hazards." And the penultimate paragraph of this point says that "external lightning protection is generally not required for biogas plants."

These statements seem logical, because it does not necessarily have a potential ignition source (lightning here) are attracted, which is normally not given, if, for example, the plant is not in an exposed position.

In regards to the organizational protective measures, the following statement can be found in the same technical information under point 4. “Lightning protection measures”:
"It must be regulated that the gas system shall not be opened during thunderstorms and people shall not enter exposed areas, especially those areas in which an explosive atmosphere can occur.” This is done e.g. by means of an operating instruction.

Conclusion:
Proper grounding, equipotential bonding and overvoltage protection are always required and prescribed.
If additional lightning arresting devices are required for the external lightning protection, they must be first checked in a lightning protection risk analysis considering the location of the plant and its installations.

Munich, March 2018

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