

LIGHTNING STRIKE PROTECTION GUIDANCE FOR BIOGAS PLANTS

Summary

The following guidance outlines key steps that should be taken to enhance the resilience of Biogas Plants against lightning strike events.

Over the past decade, several biogas plants in the UK have experienced damage due to lightning strikes. Thankfully, no fatalities have occurred. However, the potential repercussions, both in terms of damage and negative publicity, pose a significant threat to individual plants and the broader industry.

Implementing robust protective measures is crucial to safeguarding the integrity of biogas plants and preventing potential reputational damage.

Mitigating the Risks of a Lightning Strike

The Regulatory Position

The following regulations place a duty on site owners and operators to mitigate the risk of Lightning as a source of ignition and fire.

DSEAR & BS EN 62305

The Dangerous Substances and Explosive Atmosphere Regulations (DSEAR) 2002 are goal setting regulations, supported by an Approved Code of Practice (ACOP). These set out the legal expectations for explosion prevention, including a Lightning Protection (LP) risk assessment. Lightning is considered a source of ignition.

In setting out the expectations for LP design and implementation for AD sites the DSEAR regulations refer to BS EN 62305:2011 Parts 1-4. The British Standard European Norm (BS EN) 62305 Series, consists of four distinct parts, under the general title 'Protection Against Lightning Risk'.

Undertaking an LP Risk Assessment

The potential for lightning strikes at biogas plants is specific to each site, with regards to design, e.g. the height of the tanks, technology, presence of people, and the surrounding topography. **A generic lightning protection study must not be used**, and the assessment should be in line with BS EN 62305-2. A suitable and certified lightning protection assessor must be used.

BS EN 62305-2 (part 2) Risk Management does not concentrate so much on physical damage to structures caused by a lightning strike but more on the risk of loss of human life (including permanent injury), loss of service to the public, and economic loss.

The British Standard (part 2) defines distinct types of damage and loss. The ones relevant to AD are:

- D1 risk to life by electric shock,
- D2 damage to structures,
- L1 loss of life,
- L4 loss of economic value.

The BS requires the risk to be reduced to a tolerable level for D1/L1. For plant, including digesters, there is an economic evaluation to be undertaken by the owner of the plant; this cannot be done by a lightning assessor as they can only provide the cost of the protection element.

The BS proposes that the cost of protection plus residual loss should be less than total loss. In other words, if the cost of protection plus the residual loss is greater than the total loss, it might indicate that the proposed protective measures are not cost-effective or that alternative strategies should be considered.

For buildings routinely staffed by people a risk assessment will nearly always result in specific protection measures being required.

The BS allows for the use of “natural components” i.e. use of parts of the structure to provide the earth path. Natural components are typically metallic structural items that will not be modified during the life of the structure, such as reinforcing steel, metal framework and roofing. By introducing the safety measures identified through the LP Risk Assessment, the chances of a lightning strike will be greatly reduced.

The Lightning Protection System (LPS)

The Lightning protection system should be certified in compliance with the British Standard **BS EN 62305**. This will ensure a suitable LPS design with the best protection of the plant and will benefit from lower premiums from Insurance companies.

LPS Routine Maintenance

Establish a routine maintenance schedule for the LPS to maintain the resilience of the biogas plant against a lightning strike.

Consult with Technology providers that will assist with controls and mitigation measures arising from the DSEAR/ Lightning Protection study report and extreme weather events that are becoming more constant due the climate change.

- Carry out a DSEAR Risk assessment and review it annually or after any change/incident occurs and implement any additional mitigation measures.
- Ensure that LPS components passing through a hazardous area are suitable for that area. Adding a LPS that is not suitable in a hazardous area could increase the risk of explosion.
- Commission the LPS provider to check and test the system annually.
- Carry out Extreme Weather events Risk assessment yearly or after change/incident occur (include Hazards such Storms, Lightning, Flood, High Wind Speed, High temperatures, Low temperatures, subsidence/earthquake and others that deemed relevant to the local situation).
- Carry out Lightning Protection maintenance as per BS EN 62305

Potential Challenges

You may need to obtain supplementary planning permission from the local planning authority to retrofit an LPS, as the mitigation measures may impact sightlines. This will require the plant operator to undertake a Visual Impact Assessment (VIA). A VIA is the analysis of the potential visual impacts to the landscape and landscape views resulting from a proposed development or land management action.

As a consequence, seeking planning permission to retrofit an LPS can be a slow process. Therefore, it is recommended that wherever possible an LPS is designed into the original ‘full application’ for a new facility.

The HSE and the environmental protection bodies in England, Wales, Scotland and Northern Ireland are supportive of the implementation of further measures to mitigate impacts from extreme weather events.

This Guidance is only applicable for Plants that will fall outside the scope of the COMAH regulations. If your site will fall under COMAH further Control measures could be applicable.

Note:

Lightning protection and equipment grounding (earthing) are two different issues. Equipotential bonding is part of lightning protection - it is part of the method of providing a path to earth. It is different from equipment protective earth but the supplementary and equipotential bonding are part of Electricity at Work safety and lightning protection.

Further Guidance

Multi-part Document BS EN 62305 - Protection against lightning

BS EN 62305 - 3:2011 Part 3: Physical damage and life hazard

Dangerous Substances and Explosive Atmospheres Regulations - HSE

Lightning protection at onshore hazardous installations - HSE

The Dangerous Substances and Explosive Atmospheres Regulations 2002 - Fire and explosion - HSE

COMAH - Guidance - HSE

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