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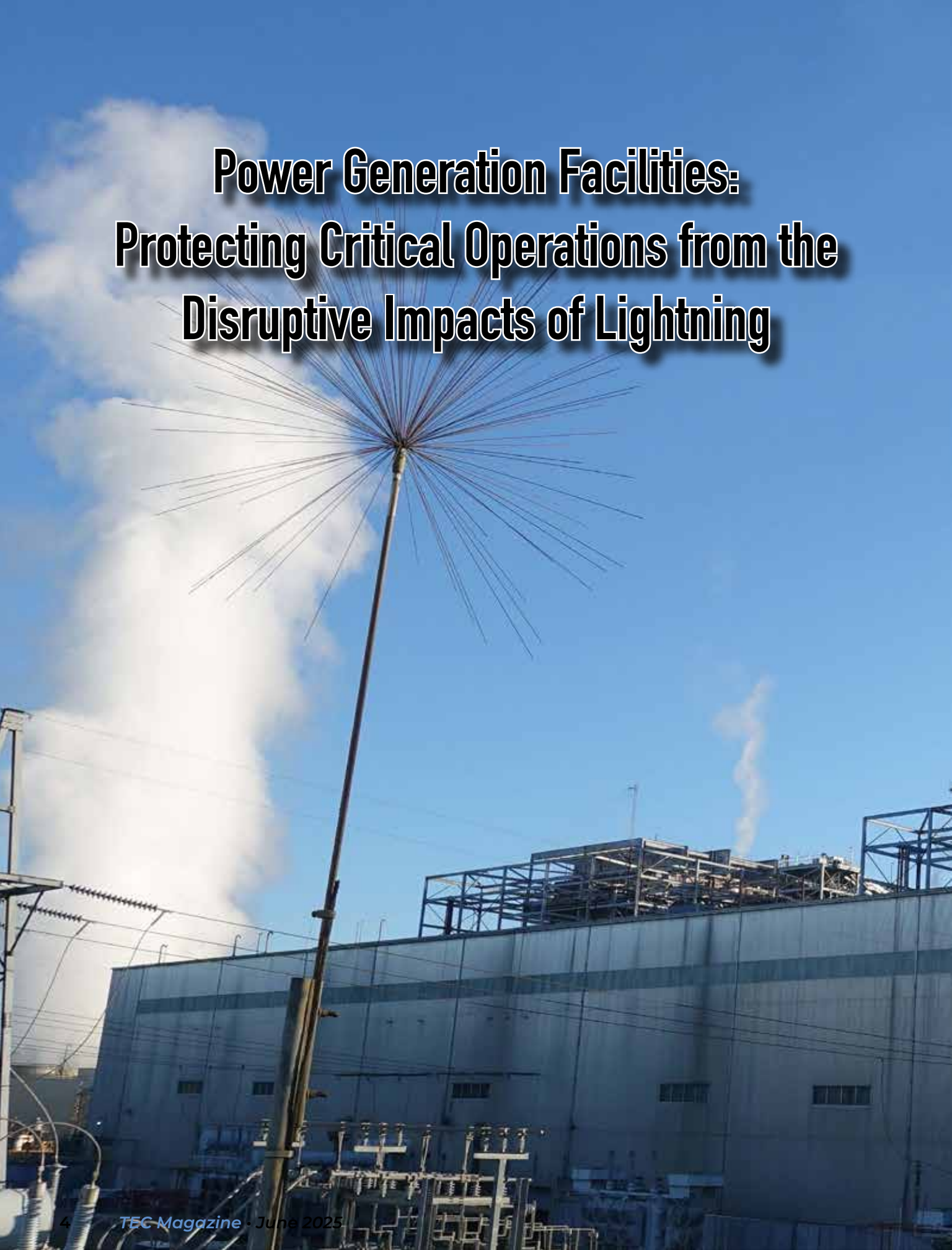
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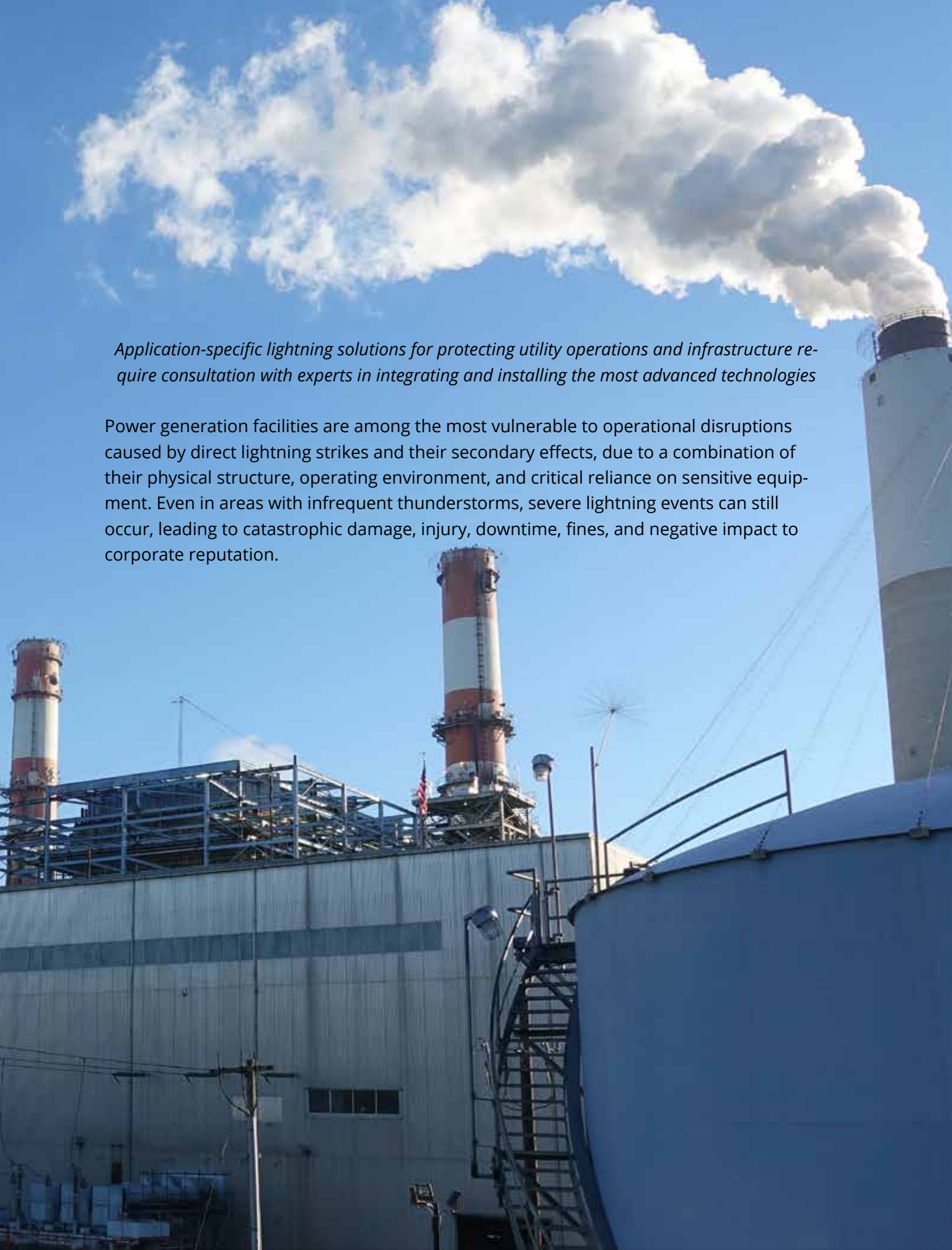
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Power Generation Facilities: Protecting Critical Operations from the Disruptive Impacts of Lightning





Application-specific lightning solutions for protecting utility operations and infrastructure require consultation with experts in integrating and installing the most advanced technologies

Power generation facilities are among the most vulnerable to operational disruptions caused by direct lightning strikes and their secondary effects, due to a combination of their physical structure, operating environment, and critical reliance on sensitive equipment. Even in areas with infrequent thunderstorms, severe lightning events can still occur, leading to catastrophic damage, injury, downtime, fines, and negative impact to corporate reputation.

When this occurs, the financial consequences can be devastating. A single strike can ignite fires, destroy valuable assets, and lead to costly downtime and environmental damage.

This is leading many power generation facilities to adopt lightning defense strategies designed to protect structures, equipment, and personnel. However, with many technological advances since the invention of the Franklin Lightning Rod more than 250 years ago, navigating the maze of potential lightning protection solutions can be daunting.

Lightning defense is a specialized body of knowledge that has accumulated since the days of Ben Franklin. Broadly speaking, lightning defense encompasses two key approaches: lightning protection and lightning avoidance, such as Charge Transfer technologies. Proper grounding and surge protection are also critical.

Due to the wide range of available technologies, mounting an effective defense against lightning-related threats typically requires a tailored strategy that integrates multiple solutions, each having its own specific purpose for minimizing damage or avoiding it altogether. The optimal combination depends on the specific site conditions and the nature of the operation.

To navigate this complexity effectively, it is essential to engage qualified lightning protection experts who can conduct thorough site evaluations, identify and prioritize vulnerabilities, and recommend appropriate protection solutions.

“Rather than offering a one-size-fits-all solution, lightning protection and mitigation recommendations should be tailored to a facility’s unique vulnerabilities, whether that involves direct strike avoidance, secondary damage caused by a nearby strike, or grounding improvements,” says Brian Daugherty, Engineering Sales Manager at Lightning Eliminators & Consultants, Inc. (LEC), a

pioneer in the field of lightning protection in since 1971.

According to Daugherty, LEC engineering and sales engineers have a combined over 160 years of experience in lightning protection. Today, LEC’s solutions protect critical operations and structures for some of the world’s most recognized companies, including Federal Express, UPS, Marathon Petroleum, Chevron, ExxonMobil, Telluride Ski Resort, and thousands more.

Vulnerabilities Exposed

According to Daugherty, power generation facilities are particularly vulnerable to lightning strikes due to several interrelated factors. Sites are often located in open areas such as flat plains with elevated structures, which naturally increases their exposure to lightning. Many generation facilities, especially those using fossil fuels, natural gas, or nuclear power, have tall structures such as stacks, turbines, cooling towers, or transmission towers that naturally attract lightning.

Modern generation facilities also rely heavily on sensitive electronics and digital control systems (e.g., SCADA, PLCs, CEMS) that are highly sensitive to transient overvoltages. Even indirect strikes can disrupt or damage these systems.

Since generation facilities operate continuously and are often critical to grid stability, even momentary disruptions can lead to significant operational or safety consequences. Restarting after shutdowns can be a slow and complex process, making lightning-induced outages particularly costly during high-demand periods.

Reputational damage is an often overlooked but impactful risk. Frequent lightning-related disruptions can erode public trust, particularly if service delivery or product quality is compromised.

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fully mitigated, the residual effects—such as earth currents, atmospheric transients, secondary arcing, electromagnetic pulses (EMP), and ground potential rise (GPR) can severely degrade system components. These secondary effects can result in equipment failure, operational downtime, or even false and erroneous system behavior.

Compounding the challenge, utility demands are expected to rise over the next five years largely because of the growth in electric vehicles, electric heating systems like heat pumps, and the rapid expansion of data centers. Charging stations for electric vehicles, especially high-speed chargers, require large amounts of electricity at once, placing new and heavy demands on local grids. In homes and businesses, electric heat pumps are replacing gas or oil systems, sharply increasing electricity use during heating and cooling seasons. Data centers, which support cloud computing and artificial intelligence, consume massive amounts of continuous power and are being built at a faster pace across many regions.

For these reasons, comprehensive lightning protection systems are critical in safeguarding facilities from structural damage, catastrophic safety incidents, unplanned downtime, and expensive process restarts.

Protecting Facilities

Daugherty says the appropriate combination of solutions can only be determined through a comprehensive evaluation of each facility's current protection measures, grounding systems, and overall risk exposure.

"Understanding a facility's past issues, vulnerabilities, and protection goals helps determine whether the solution should focus on grounding enhancements, surge protection, direct strike avoidance, secondary damage from a nearby strike, or a combination of all three," says Daugherty.



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By conducting a thorough site assessment, LEC helps facilities identify vulnerabilities and implement customized mitigation strategies, whether that means improving grounding, adding targeted surge protection, or implementing direct strike mitigation solutions.

Prevention is the Best Defense

According to Daugherty, the most effective defense is to prevent a lightning strike from occur-

ring. This is a far superior solution than a lightning rod-based system that attracts lightning to the protected site and then attempts to manage the strike.

Lightning occurs when the difference in potential between storm clouds and the earth reaches a critical level, triggering an electrical discharge. For lightning to strike, it requires a connection between a downward leader from the cloud and an upward streamer from the ground.

The Dissipation Array System® (DAS®) from LEC is designed to prevent direct lightning strikes within its designated protection area by lowering the electric field to levels below those required for lightning to form.

DAS prevents these connections by using point discharge technology, which neutralizes the charge differential before a strike can occur. Through a system of well-grounded points, DAS facilitates the exchange of ions between the air and the ground, disrupting the conditions necessary for a lightning strike.

DAS can be integrated with a wide range of structures, including buildings, towers, tanks, and stacks. Since its inception, over 3,500 DAS installations have been deployed worldwide, accumulating more than 90,000 system-years of effective performance. Testimonials from industry leaders confirm its effectiveness, with companies reporting significant reductions in down-



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LEC even offers a “No-Strike” warranty for all supervised installations, ensuring complete protection when the system is properly maintained and inspected.

The effectiveness of DAS is enhanced when combined with a comprehensive lightning protection system that includes a low-impedance grounding system, transient voltage surge suppression, and modular strike prevention devices. Together, these components ensure optimal protection against both direct strikes and secondary electrical surges.

Expertise in Installation

While the proper combination of component technologies is crucial, having a single source oversee the installation of these systems can also be a key aspect of effective implementation.

Traditional lightning protection methods typically involve engaging separate vendors for system design, material procurement, and installation. This fragmented approach often results in miscommunication, extended project timelines, and increased costs.

“A turnkey provider that consolidates all project phases under a single expert team ensures unified accountability, accelerates execution through streamlined coordination, improves system performance through integrated component design, and lowers overall costs by reducing errors, rework, and inefficiencies caused by misaligned vendor efforts,” says Daugherty.

Considering the increasing risks posed by lightning-related events, power generation facilities cannot afford to rely on outdated or piecemeal lightning protection strategies. As operations become more complex and the consequences of downtime more severe, the need for a site-spe-

cific lightning protection strategy is imperative. Technological advancements now offer a range of solutions far beyond traditional methods, but selecting the right combination requires deep expertise and an understanding of each facility’s unique vulnerabilities.

To ensure maximum safety, reliability, and operational continuity, facilities are strongly encouraged to schedule a professional site assessment. A tailored evaluation by qualified experts can uncover hidden risks, assess the effectiveness of existing systems, and guide the implementation of integrated lightning protection strategies. This proactive step not only safeguards critical infrastructure and personnel but also helps prevent costly disruptions and reinforces a facility’s long-term resilience against lightning-related threats.

For more information: call 303-447-2828; email info@lecglobal.com; or complete the Free Lightning Risk Assessment For Critical Operations on the Contact page of the website. •



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Preventing Factory Fires with Essential Monitoring Equipment



Del Williams

Manufacturers can deter fire-prone production conditions with testing to ensure safety and productivity

At the factories that produce the materials and goods essential to the nation, supply chain issues have continued to accelerate since 2020. However, factory plant managers and production line workers may not realize that the industry experienced even greater disruptions in 2024 than in previous years. By one account, there was a 38% increase in supply chain disruption last year.

What is the leading cause of these disruptions? Factory fires.

Factory fires threaten the facility, disrupt productivity, and endanger the entire workforce. Consequently, taking the necessary precautions, which includes using equipment capable of detecting and preventing fire prone conditions, is essential to mitigate the growing risk of fire and ensure a safe working environment.

The Urgent Need to Minimize Fire Risk

In 2024, there were 2,299 recorded factory fires worldwide. The majority of these fires occurred

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production lines—without fully assessing the associated risks. This often resulted in gaps in critical safety protocols, driven by short staffing or shifting priorities, which in turn increased the likelihood of undetected hazards.

In some cases, insufficient training resulted in the mishandling of chemicals, posing serious safety risks to both workers and the facility. Additionally, delays in maintaining critical equipment or systems increased the risk of operational failures, safety incidents, and costly disruptions.

Machinery issues were a significant factor in factory fires in 2021 as well. According to Resil-inc, a supply chain risk management company, 59% of the factory fires analyzed that year were linked to faulty equipment. Common causes included improper installation, operation, or maintenance; inadequate safety and cleaning procedures; and failure to replace outdated or worn-out equipment on time. Additionally, insufficient employee training, particularly a lack of awareness of key risks, was often a contributing factor.

Specific conditions on or around the production line can also increase the risk of a fire.

“Manufacturers need to be aware that combustible dust can contribute to fires when sparking occurs—and that almost every material can be combustible in dust form, including wood, metal, dyes, food, and chemicals,” says John Bogart, Managing Director of Kett US, a manufacturer of a full range of moisture and organic composition analyzers.

in facilities within the United States, followed by incidents in India and Germany. Many of these fires took place in manufacturing-focused factories.

A range of operational and supply chain challenges have contributed to the increased fire risk. In recent years, global disruptions have led to labor shortages, regulatory delays, and reduced oversight in some facilities. As a result, many factories operated with fewer skilled workers on-site, while employees were often required to take on additional responsibilities with limited support.

At the same time, some factories quickly adapted their operations—such as introducing new chemical processes or expanding existing

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Bogart adds that chemical plants face an increased fire risk when excessive friction occurs. Similarly, mechanical equipment can become a fire hazard if it is not properly cleaned, maintained, and lubricated, leading to overheating and, in some cases, ignition.

Since many of these issues are largely preventable, industry professionals emphasize the importance of awareness and proactive measures.

“By prioritizing equipment maintenance, providing comprehensive training, and conducting regular safety inspections—even during periods of disruption—factories can significantly reduce

the risk of fires and safeguard both employees and assets,” says Bogart.

In addition, Bogart recommends equipping factories with instruments that can detect hazardous conditions on the production line, which is essential for preventing fires and improving overall safety.

To address this need, industry OEMs have developed a variety of equipment specifically designed to prevent the hazardous conditions that can lead to factory fires. For example, Kett’s pulp and paper moisture meters line can prevent over drying, leading to higher fire risk, when producing paper-related products.

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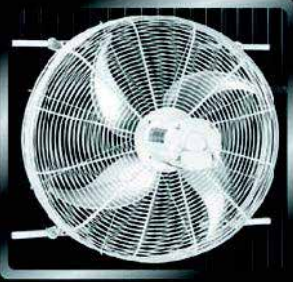
The OEM's engineers assist manufacturers in selecting portable and inline laboratory-quality instruments to enhance factory safety and reduce fire risk. These instruments are designed for fast, efficient operation and are user-friendly, ensuring effective monitoring by any operator, regardless of who is on-site.

Factory fires pose a serious risk to workers, equipment, and overall operations, yet many are preventable with the right precautions. Equipping facilities with advanced monitoring instruments ensures early detection of hazardous conditions, allowing for quick intervention before a fire can start.

By investing in reliable safety equipment, manufacturers can reduce fire risks, maintain productivity, and protect both personnel and assets. Proactive safety measures, including proper training and routine maintenance, combined with the right detection tools, are essential for ensuring a safer, more resilient production environment.

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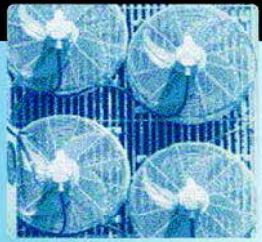


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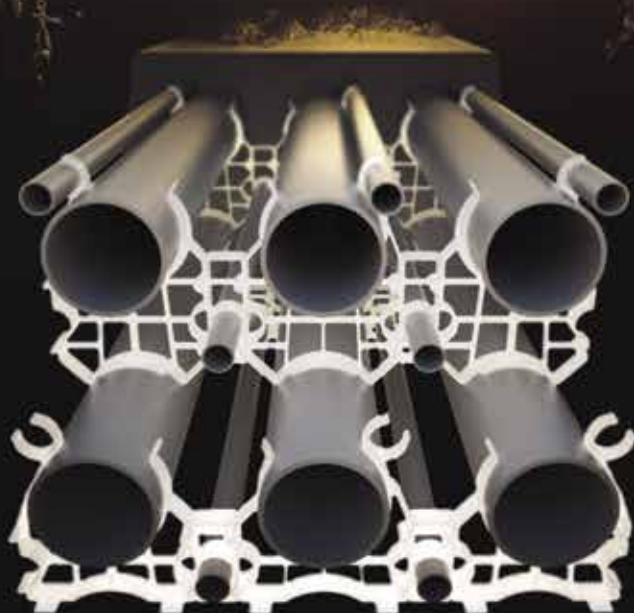
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