PFAS-free training solutions for lithium-ion battery fires

Anogas has developed a PFAS-free Hydrogel technology for firefighting training, addressing the environmental and health risks associated with traditional fluorinated foams and providing realistic simulations of lithium-ion battery fires

FOR MANY decades, firefighting training grounds around the world have become heavily contaminated with PFAS due to the widespread use of PFAS-containing firefighting foams, particularly aqueous film-forming foam (AFFF). During training exercises, large quantities of foam were repeatedly discharged directly onto open ground, often without proper collection or containment systems. As a result, PFAS compounds penetrated the soil and groundwater, creating long-term environmental pollution. Because PFAS substances hardly degrade naturally, they are commonly referred to as 'forever chemicals.'

The contamination of firefighting training sites has become a major environmental and public health concern. PFAS can migrate through groundwater systems and contaminate drinking water sources, agricultural land, and surrounding ecosystems. Scientific research has linked exposure to certain PFAS compounds to serious health risks, including immune system disruption, hormonal imbalance, liver damage, and certain forms of cancer. These concerns have led governments and regulatory authorities worldwide to increasingly restrict or ban the use of fluorinated firefighting foams.

PFAS-free Hydrogel technology from Anogas

In response to these environmental challenges, Anogas has developed a PFAS-free training extinguishing agent based on advanced Hydrogel technology. This innovative extinguishing medium offers a sustainable alternative for realistic firefighting exercises without the environmental risks associated with traditional fluorinated foams. The Hydrogel training agent is specifically designed for use in modern firefighting scenarios, including incidents involving lithium-ion batteries.

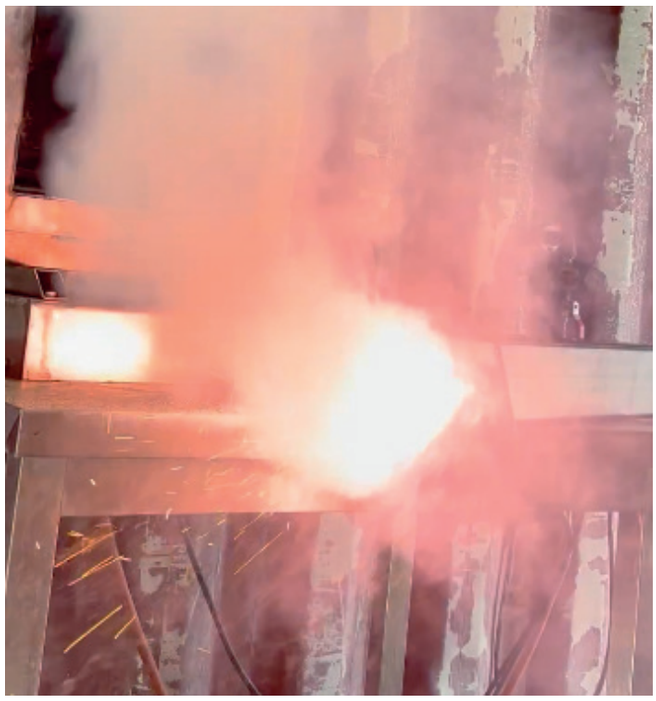
The increasing use of lithium-ion batteries in e-bikes, electric vehicles, energy storage systems, and consumer electronics has created a growing need for specialised firefighting training. Many people question whether lithium-ion battery fires can actually be extinguished and whether it is safe to intervene at all. The dilemma is that lithium-ion battery fires can develop extremely

rapidly due to thermal runaway, potentially leading to explosions, intense heat release, and the emission of highly toxic gases. Immediate and effective intervention is often essential to prevent major consequential damage to buildings, vehicles, and surrounding property.

The importance of realistic lithium-ion battery fire training

Responding safely and effectively to lithium-ion battery incidents requires specialised knowledge, tactical understanding, and practical skills that can only be obtained through realistic training. Traditional live-fire exercises with actual lithium-ion batteries are often too dangerous, unpredictable, and environmentally undesirable for routine firefighter training purposes.

To address this challenge, Anogas has developed, in cooperation with Pyroworks, a safe and highly realistic lithium-ion battery fire simulation system. The simulation recreates a common real-life scenario in which an e-bike battery, while being charged inside a residential environment, goes into thermal runaway. This type of incident has become increasingly common in homes, apartment buildings, garages, and bicycle storage facilities.



The lithium-ion battery fire is simulated using a specially designed fire torch installed inside an e-bike battery module, which is electrically ignited. The system realistically reproduces the rupture of the battery casing, followed by intense smoke development and a rapidly developing jet flame that closely resembles the behaviour of a real thermal runaway event. This creates a highly realistic training environment in which firefighters can safely experience the dynamics, risks, and progression of lithium-ion battery fires under controlled conditions.

Training specialised firefighting techniques

The training system enables firefighters to practice essential operational procedures such as scene assessment, hazard recognition, safe approach techniques, ventilation strategies, cooling methods, extinguishing tactics, and reignition prevention. Because the scenario closely simulates real incidents, firefighters gain valuable hands-on experience that improves confidence, decision-making, and operational effectiveness during actual emergencies.

Extinguishing a lithium-ion battery fire also requires specialised firefighting techniques that differ significantly from conventional firefighting operations. The Anogas Hydrogel training extinguishing agent allows these techniques to be realistically trained and continuously perfected. On the training module, the Hydrogel extinguishing medium behaves in the same way as it would during a real lithium-ion battery fire. This allows firefighters to realistically observe cooling performance, adhesion characteristics, vapour suppression, and fire control behaviour while operating in a safe training environment.

The combination of early detection, appropriate personal protective equipment, and effective extinguishing technology significantly increases the chances of safely controlling an incipient lithium-ion battery fire before it escalates into a major incident”

Reducing fear and limiting damage

This innovative training method also helps to reduce the fear and uncertainty that often surround lithium-ion battery fires and their potential consequences. It is important to remember that approximately 80% of incipient fires can be successfully extinguished through the correct use of portable firefighting equipment. By providing firefighters and first responders with realistic training and practical experience, they are better prepared to act quickly and effectively during the early stages of a lithium-ion battery fire.

Fast and adequate intervention, supported by proper training, can significantly reduce the consequences, escalation, and damage associated with emerging lithium-ion battery incidents. Early recognition and immediate action are essential for preventing small battery failures from developing into major fires or explosions.

The importance of detection and personal protection

In addition to selecting the correct extinguishing agent, proper personal safety equipment and early fire detection are essential when dealing with lithium-ion battery fires. A suitable gas mask or respiratory protection system is necessary because lithium-ion battery fires can release highly toxic and hazardous gases. Furthermore, smoke detectors play a critical role in the early detection of thermal runaway incidents, providing valuable time for evacuation and rapid intervention.

The combination of early detection, appropriate personal protective equipment, and effective extinguishing technology significantly increases the chances of safely controlling an incipient lithium-ion battery fire before it escalates into a major incident.

A sustainable and future-proof training solution

The combination of the advanced lithium-ion battery fire simulator and the PFAS-free Hydrogel extinguishing agent offers a unique and environmentally responsible solution for modern firefighter training. Firefighters can train realistically for one of the fastest-growing fire risks in today’s society while avoiding the environmental contamination associated with conventional PFAS-containing firefighting foams.

By combining safety, realism, sustainability, and innovation, Anogas and Pyroworks provide firefighting organisations with a future-proof training solution that prepares emergency responders for the challenges of lithium-ion battery incidents in a responsible and effective manner.

Anogas
Hydrogel

Harry Verbakel
Managing Director / Co-owner
Anogas BV
+31 6 2250 3282

www.anogas.com

harry@anogas.com / info@anogas.com

@ anogas

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