

Flame Retardants: A Critical Safeguard for AI Data Centers



Artificial intelligence is transforming the global economy, driving demand for advanced data centers that rely on sophisticated electronics, electrical grids, cooling systems, and energy storage technologies that must perform continuously and reliably. But the unprecedented scale, speed, and power density at which these facilities operate has led to increased attention on fire safety, particularly around electrical faults, lithium-ion batteries, and heat management.

Flame retardants play a critical role in supporting AI fire safety by reducing ignition risk and slowing fire growth throughout data center infrastructures. They provide an invisible but essential layer of protection that helps reduce fire risk at the material level, safeguarding critical systems, and ensuring the resilience and reliability of this innovative technology.



Statistics and Research:

- An [18 year review \(June 2003–March 2021\)](#) identified 31 data center fire incidents, averaging roughly ~1.5 significant incidents per year. While incidents are relatively infrequent, [the threat remains significant](#) due to facilities' high-tech environments and criticality of their operations.
- Business impact can be severe: analyses cite outage costs of roughly [\\$250,000 to \\$500,000+ per hour](#) depending on the operator and workload.
- Lithium ion battery failures can produce [rapid, high temperature events](#); thermal runaway can spike above 1,000°C, accelerating escalation and complicating suppression.
- Multiple recent high profile incidents and investigations have [linked data center fire impacts](#) to battery rooms/UPS design and lithium ion risks, increasing scrutiny of fire safety measures.

Why Flame Retardants Matter in AI Data Centers

Higher power densities associated with AI workloads [increase heat generation](#), placing greater importance on material level fire resistance in electronic and electrical components.

Electronic equipment [contains polymer-based materials](#) that can contribute to fire spread if not properly engineered for fire performance.

Passive fire safety measures, including flame retarded materials, [are essential in facilities](#) designed for high automation and limited on site staffing.

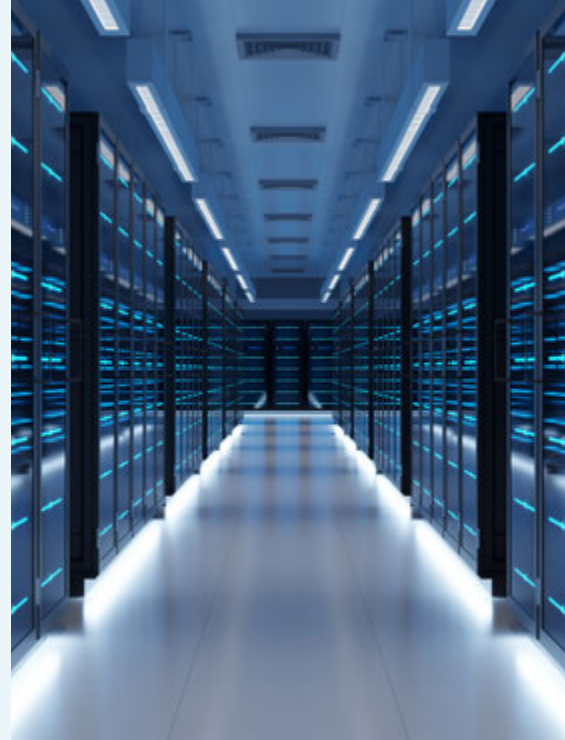
Modern data centers rely on extensive cabling, power distribution, and cooling systems, all of which must be [designed to manage electrical and thermal risk safely](#).

Lithium ion batteries are [increasingly used in UPS and energy storage systems](#), offering efficiency benefits while requiring specialized fire risk mitigation.

Major fires have [outsized consequences](#), including downtime and damage, even if overall frequency is low.

Key Benefits FRs Bring to the AI Industry

- Reduces ignition likelihood in plastics and polymer components that appear throughout electronics and facility infrastructure.
- Slows flame spread and heat release, helping contain an incident long enough for detection and suppression systems to act.
- Protects high value digital assets and infrastructure from damage, destruction, or corruption.
- Limits secondary damage (soot, heat exposure, cascading failures) that can destroy sensitive IT equipment even when flames are localized.
- Improves resilience and uptime by mitigating one of the most disruptive classes of facility incidents (fire leading to extended downtime).
- Supports compliance and insurance expectations as data center fire safety measures face increasing scrutiny amid battery adoption and growing facility scale.



Key Applications of FRs in AI Data Centers

- Printed circuit boards and electronic assemblies used in servers, GPUs, power supplies, and networking equipment.
- Wire and cable insulation throughout data halls and electrical distribution systems.
- Server racks, enclosures, and structural polymer components within high density computing environments.
- Battery housings and UPS system components, where lithium ion adoption is increasing.
- Cooling system components and airflow management materials, which expand as power and heat loads increase.

As AI continues to drive growth in data center scale and capability, fire safety remains a core design consideration. Flame retardants contribute to a layered, science based approach to risk management and protection of critical infrastructure. Through responsible material innovation and adherence to established safety standards, flame retardants support the reliable operation of the AI systems that underpin today's digital economy.

