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INTERNATIONAL FIRE PROTECTION

THE GLOBAL VOICE FOR PASSIVE AND ACTIVE FIRE PROTECTION

Special Report

Early warning fire detection in underground stations

It is time to challenge the traditional approach to fire prevention!

Existing fire-prevention models from around the world are well-founded: they consider organizational, structural, defensive as well as system-aided methods to minimize the impact of fires. They all have one thing in common: they do not fully consider the revelations from fire statistics regarding the origins of a majority of fires. Device-integrated detection and suppression can advance the existing approach and address the cause of more than a third of all fires.

Rajko Eichhorn

The fire triangle explains that the three factors needed to start a fire are combustible material, oxygen and energy (heat). It is estimated that as little as 3.5 Watt is enough to start electric fires, if only combustible material and oxygen are available. And they are!

Just before the holiday season in 2019, there was a product recall initiated by the CPSC (USA, Consumer Product Safety Commission) for a Halloween-themed LED light powered by three AAA batteries, carrying the inherent risk of overheating and sparking, potentially starting fires – and there have been reports about this very product having started fires!

Considering the fact that as little as three AAA batteries can start electric fires can be scary, particularly when considering fire statistics from around the world. Such statistics are compiled from collected data about quantities and sources of fires, and they are available publicly. By evaluating data from technologically advanced nations like Germany or the USA, it can be found that more than 30% of all fires are started by electricity, electric products and installations.

These recorded fires are the official numbers. Especially in factories and SMEs (small and medium-sized enterprises) of the manufacturing industry, emerging fires are often detected quickly and, hopefully, fought by trained and skilled personnel which, in such work environments, normally are (a) present, and (b) have access to fire extinguishers. Fires in production equipment, electric installation or office appliances often end up unreported due to the angst of management about retaliation from

▼ **Statistics show the causes of fires. (Source: IFS, Kiel 2002-2018)**

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their insurers or the responsible health and safety agencies. Taking these additional fire incidents into consideration, together with the large number of fires with 'unknown source' (due to destroyed evidence), it can be assumed that the number of electric fires in reality is much higher.

Smaller companies are particularly prone to the effects of fires

Business interruptions are the main risk for companies (Allianz Risk Barometer 2018). In this context, fire is considered a major cause of business interruptions. In terms of statistics, the fire risk increased by 16% in 2019 compared to the previous year. For a country like Germany, this means that every five minutes there is a fire in a company.

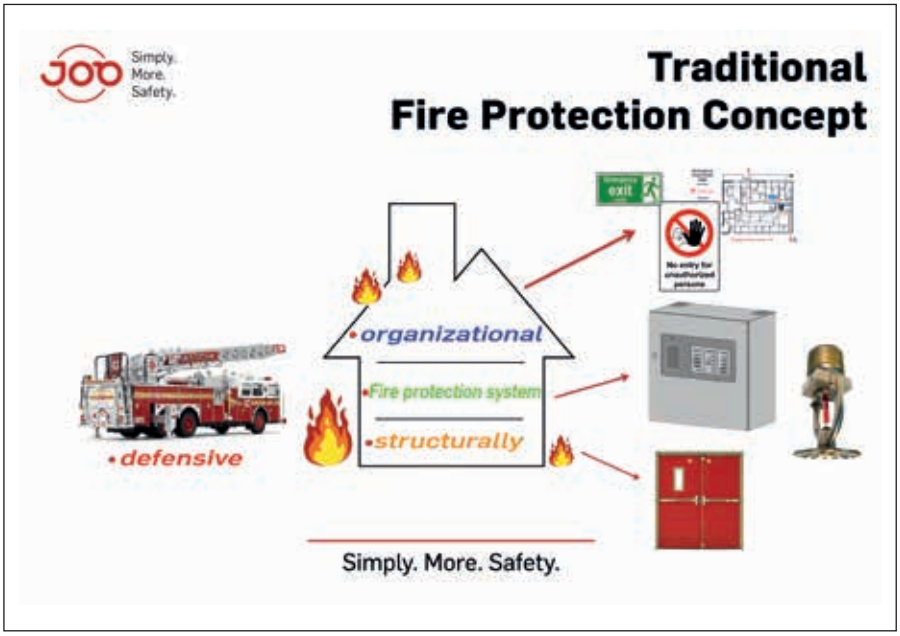
Every third fire situation in the industry causes assets damage of more than 500,000 Euros, with the result that most of the companies hit will not recover from this event financially. Only 23% of all companies who have had a fire can fully resume their business operations sometime after the incident. On the other hand, over 40% of companies will have to completely shut down their business after a fire. It is SMEs in particular that often treat fire protection only superficially and only implement the minimum as required by law, without being aware of the looming economic consequences of this approach.

The traditional fire-protection approach

In many countries there is an abundance of codes and standards assuring fire safety. Often ridiculed for being 'over regulated' in regard to fire regulations it is the European countries and the United States in particular who have a comprehensive list of applicable regulations aiming to protect the health of its people and values.

The current concept focuses on four aspects of protection:

- Structural fire protection, e.g. building materials
- System-aided (technical) fire protection, e.g. alarm panels
- Organizational fire protection, e.g. emergency procedures
- Defensive fire protection, the first responders and firefighters



▲ **The current fire protection concept does not regard the possible sources of the majority of fire causes. (Source: JOB GmbH, Germany)**

The problem with this approach is that, when considered exclusively, it does not sufficiently protect from the dangers of fires! This hypothesis might seem controversial at first, but when looking back at the data from the statistics, it becomes clear that even when applying all legal requirements, considering and (hopefully) implementing all required measures, there is still significant loss of lives and values each year from fires – fires of which over 30% are started by electric and electronic devices, installations or electric appliances.

Triggers of electrical fires

There are a wide variety of triggers for electrical fires:

- weak soldering spots
- manufacturing errors
- inadequate plug connections
- impermissible operating conditions
- component failure.

All of these causes, combined with ever-increasing electrification, can be felt by people in the form of fires, damages, business interruptions and product recalls.

Existing protective measures such as residual current switches, contactors or fuses often fail to recognize a fault-condition or only detect it very late while defensive actions like using a fire extinguisher requires people to be present when the fire starts. Many of the above listed causes of error are even not directly influenceable or avoidable by a manufacturer or operator.

This explains why the inherent risks from electric and electronic products and installations are often not recognized and subsequently are not taken into consideration to their full extend.

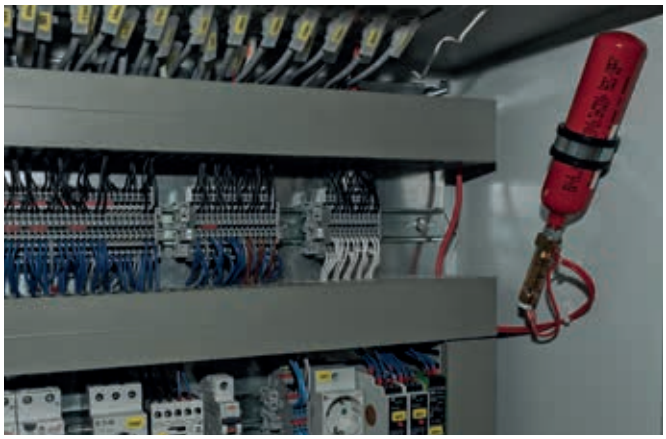
Time for a change

By no means does this article want to imply that any of the extremely important, proven and thus effective actions of the traditional fire-protection concept should be disregarded. Still, the numbers of injuries, deaths and losses from fires are way too high to be acceptable for a modern society. From the statistics of fire causes can be derived that mitigating the inherent fire risk of electric and electronic products, devices and installations would very well complement the existing fire-protection concept.

Fire detection, suppression and reporting, implemented inside of such electric devices, becomes effective at the earliest possible point in time during an emerging fire – directly at the point of origin.

Device-integrated fire protection for saving lives and values

A cost-effective approach to reducing these incalculable risks are stand-alone, thermally triggered automatic miniature fire-extinguishing units (AMFE) and extinguishing fuses (E-Bulbs) developed



◀ **Device-integrated fire protection with AMFE inside electric cabinets detects fires reliably and extinguishes at the point of origin. Signal connections monitor the activation.**

▶ **Device-integrated fire protection with automatic miniature fire extinguishers 'AMFE' help mitigate inherent fire risks of electric devices and installations.**

and manufactured by company JOB Thermobulbs in Ahrensburg near Hamburg, Germany. These economic AMFE can be retrofitted easily into existing electric equipment and systems, providing instant reliable device-integrated fire protection. The fire detection is carried out using the same activation principle as a sprinkler – with its own VDS-approved thermos-glass ampoules. Due to the increasing heat in a device, in case of a fire the temperature-configurable thermo-ampoule bursts and opens the connected extinguishing cartridge without the need for an electrical signal and releases the approved extinguishing agent 'NOVEC' (3M) into the device. This highly efficient, gaseous extinguishing agent is non-toxic, non-conductive and residue-free after application – the starting fire is effectively extinguished immediately, directly at its source. A variant with signal terminals (S-AMFE) can be used to monitor the extinguishing activation, which can then be used to interrupt the power supply into a device and to alert operating personnel. Another variant can be used in conjunction with smoke detectors, for example, to activate the extinguishing process before the thermal triggering point (the designated activation temperature) is reached (R-AMFE). However, it will always work redundantly through thermal activation.

The smallest fire extinguisher in the world

In addition to the larger AMFE, JOB has also developed the 'Smallest Fire Extinguisher in the World'. Measuring only 5x20mm (the standard measurements of a traditional electric fuse), the E-Bulb works like a thermal sprinkler bulb but again contains the engineered 3M NOVEC extinguishing agent. Furthermore, the glass surface of the E-Bulb is electrically conductive, which makes it suitable for typical supply currents of electric and electronic devices. In case of a fire, when the activation temperature is reached, the glass bulb bursts and releases its content of extinguishing agent inside the electronic device, quickly putting out a starting fire. NOVEC has a very low boiling point and becomes a gas at the moment of release. This process effectively extinguishes even a high-energy fire by cooling, without leaving residues of the extinguishing agent or causing short circuits.

At the same time, the electrically conductive surface of the glass ampoule is destroyed which interrupts the electric current into the device. This prevents re-ignition from the supplied energy.

The effectiveness and reliability of the patented AMFE and E-Bulb has not only been independently verified and confirmed by UL, TÜV and the German VDE but also carries a VdS certification. E-Bulb and AMFE are trusted by manufacturers and users around the world to mitigate inherent fire risk in electric and electronic devices and installations.

Conclusion

The traditional fire-protection model is valid and has its merits. Every day, thanks to activities suggested by this concept, people are protected from the consequences of fires. Still, the fatalities, financial losses and injuries are way too high to being tolerated.

By looking at the causes of fires in the data available it becomes obvious that the 'point of origin' is often overlooked by exclusively following existing laws, codes or standards. The new concept of device-integrated fire protection aims to complement the existing approach by targeting the inherent fire risk from electronic and electric devices – a risk that becomes constantly bigger due to the increasing electrification of our world.

The advantages of device-integrated fire protection are manifold:

- enhanced safety for employees, customers and the general public
- significant reduction of the length and severity of business interruptions after a fire
- minimizing the damage from electric fires to the surrounding vicinity
- no additional damage from the suppression itself, limiting the financial impact of fire
- cost reduction by avoiding out-of-control large-scale fires emerging from inside an electric cabinet or machine

Most fires start small. They often remain undetected for a significant time and, eventually, cause tragic damage to assets and people.

By implementing modern, reliable, device-integrated fire-protection solutions inside electric products and installations – with little economic effort – the results can be life and cost saving!

For more information, go to www.job-group.com

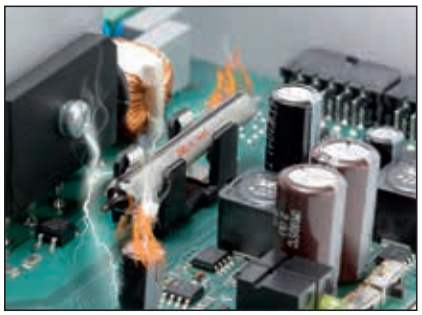
References

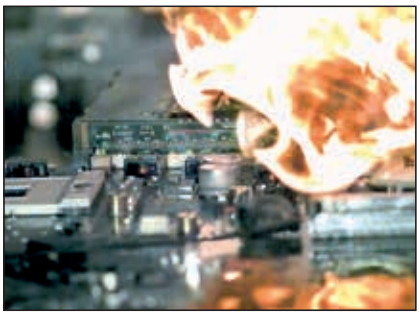
1 https://www.cpsc.gov/Recalls/2020/Mark-Feldstein-Associates-Recalls-Stacked-Gourd-Jack-O-Lantern-Decorations-Due-to-Fire-Hazard
2 https://www.agcs.allianz.com/assets/PDFs/Reports/Allianz_Risk_Barometer_2018_DE.pdf
3 see „Logistics Heute" magazine and GdV statistics (www.gdv.de)

Simply
More.
Safety

MADE IN GERMANY

SMALLEST FIRE EXTINGUISHER IN THE WORLD



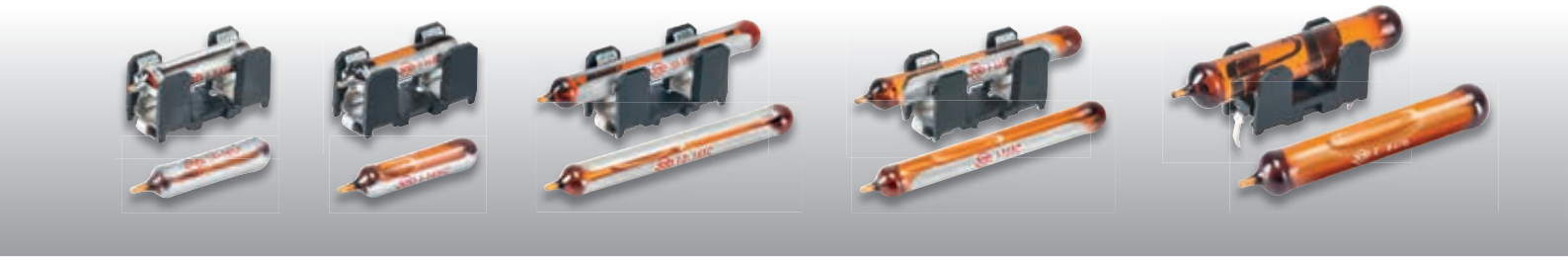


E-Bulb:

- Extinguishes the fire with 3M NOVEC engineered agent!
- Directly in the device, on a PCB!
- Interrupts the electricity (no re-ignition)

Positive contribution for TCO

- Safer products – Completing the traditional fire protection concept on product level
- Approbation advantages
- Cost saving – Lowering the risk of product recalls and product recall costs



Device Integrated fire protection

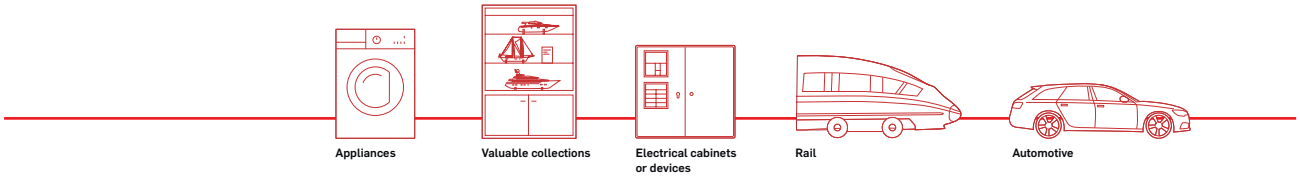
with AMFE and E-Bulb helps mitigating inherent fire risks of electronic devices and electric cabinets

AMFE:

- Reliably detects fires, extinguishes and monitors
- Fighting starting fires at the point of origin – INSIDE electric cabinets
- Uses certified engineered 3M NOVEC agent

Benefits to the user and manufacturer:

- Easy to retrofit into existing installations
- Certified and approved solution for small electric cabinets or machines
- No collateral damage in case of activation: clean, non-toxic, non-corrosive, nonconductive
- Most economical fire protection solution for small enclosures of up to 1.55m³ / 55ft³



For further information about this and our other innovative fire protection solutions, please contact JOB by email at **sales@job-group.com** or via our website at **www.job-group.de**