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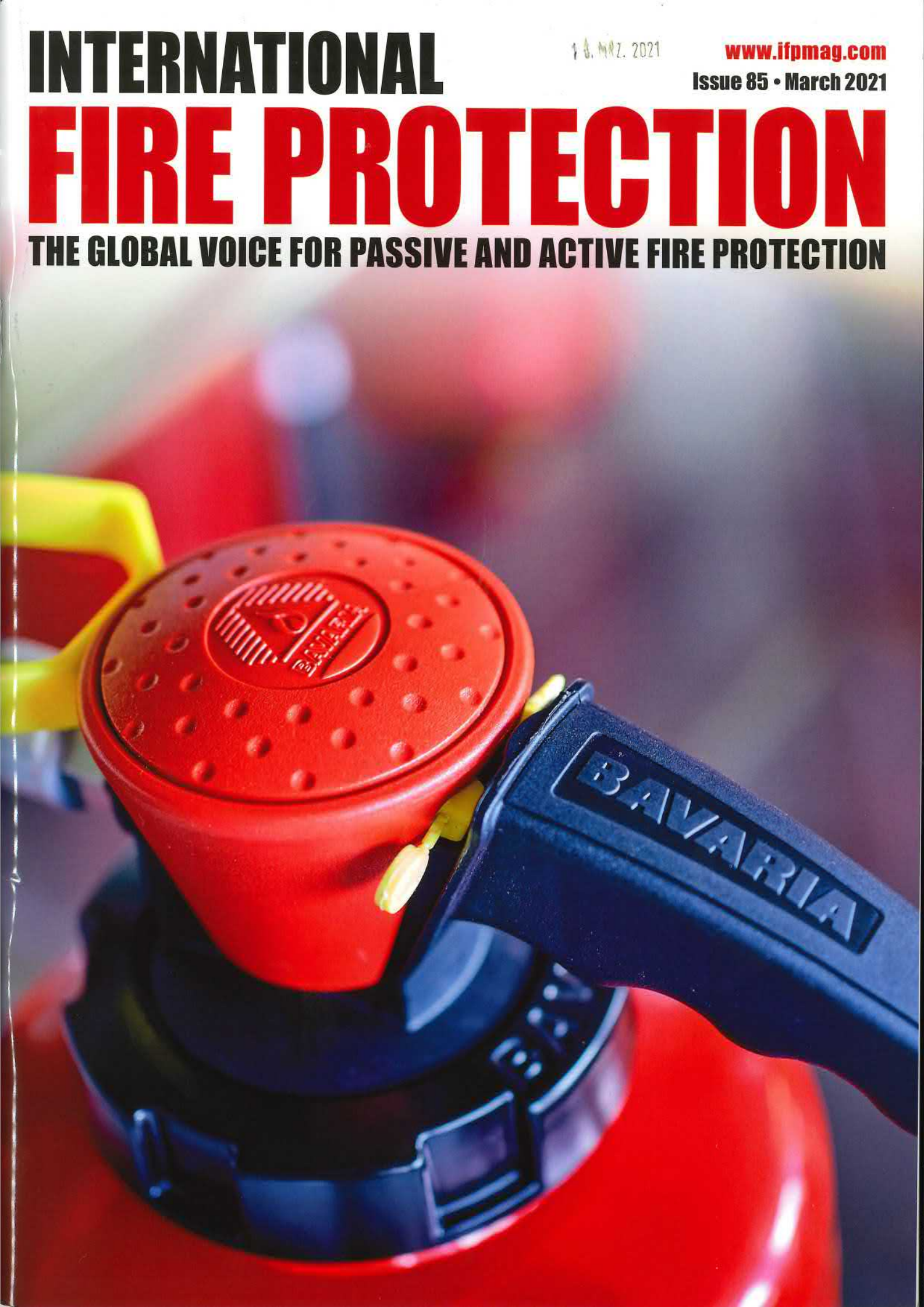
INTERNATIONAL FIRE PROTECTION

THE GLOBAL VOICE FOR PASSIVE AND ACTIVE FIRE PROTECTION



AQUASYS high-pressure water-mist systems: Expert report on fire-safety innovation

Even under critical conditions, high-pressure water mist (HPWM) systems offer unique possibilities for active firefighting through their innovative spraying technology and high-quality materials. They are used in special situations where there may be different fire loads at the same time, to protect particular assets, maintain productivity in industry or secure critical infrastructure. HPWM systems also effectively fight liquid fires (such as fuel) using normal water, without chemical additives.

Michael Bindreiter

Michael Bindreiter joined AQUASYS in 2008 and is Group Sales Manager. His technical experience is based on several project management roles in the automation department, before changing to international business development and sales for AQUASYS firefighting solutions.

Reliable, economical firefighting – Made in Austria

AQUASYS was founded in 1993 as part of a technology group and is a pioneer in the development and manufacture of HPWM firefighting systems.

As a reliable Austrian manufacturer, systems integrator and partner, AQUASYS plays its part in providing safe and efficient fire protection in line with the company's mission – 'firefighting is responsibility'.

To this end, AQUASYS combines product development, active research, 1:1 real fire tests, simulations, project management, design, system installation, commissioning, customer training, service and maintenance under one roof. With products from AQUASYS, you know you are getting high quality and efficient fire-safety solutions with the 'Made in Austria' distinction.

Operating principle and benefits of the technology

The outstanding effect of HPWM is based on potable water that is atomised into an ultrafine mist with a droplet size of 20–200µm using specially developed nozzles. This mist can very efficiently fight solid and liquid fires due to the following physical effects:

- **Cooling:** one litre of atomised water can absorb up to 2.3MJ of energy from a fire.
- **Oxygen displacement:** one litre of atomised water can expand in volume to produce up to 1,600 litres of vapour, thereby reducing the oxygen level slightly around the fire. This reduced oxygen level is always above a critical level and therefore not harmful to people, however.
- **Heat radiation:** water mist shields against thermal radiation and prevents fire from spreading.

Water mist's firefighting properties offer a number of advantages. The key benefits are:

- Exceptionally effective cooling effect on the burning substance and surrounding areas
- Highly efficient, even in the event of a concealed fire
- Harmless to people, so no pre-warning time or evacuation needed before activation
- Toxic gases are washed out and smoke particles are suppressed
- Suitable for solid, liquid and cable fires, server racks, high-voltage systems and much more
- Easy to retrofit in existing buildings and production areas

Innovative spraying technology with a proven system design

'The functional system design and the interfaces for activation and responses to the fire alarm system comply with current standards and are therefore comparable with sprinkler systems,' explains Lukas Heschl (Head of Engineering & Development at AQUASYS)

In addition to the benefits already mentioned, there is another advantage in the quality of the materials used: all AQUASYS components that come into contact with water are made of high-grade stainless steel and are therefore corrosion-resistant. This significantly extends the service life of the system compared with conventional set-ups. The piping system, which has its origins in heavy-duty industrial applications, is easy to install and ensures a reliable seal. Even the pipes that are not filled with water can withstand ambient temperatures of up to 800 degrees and of even up to 1,000 degrees for a noteworthy period.

In an emergency, water mist – being harmless to people, animals and technology – creates much better environmental conditions for the emergency services than comparable conventional suppression systems.

Complex fire loads with HPWM

The high-pressure water mist primarily acts on the fire's energy and only indirectly on the burning substance. This makes it ideal for complex fire scenarios with different liquid and solid combustibles.

Both solid and liquid fires reaching a heat release rate (HRR) of up to 200MW have been successfully fought in fire tests. This demonstrates that the AQUASYS HPWM system is also suitable for use in tunnels, where such high fire loads can be reached in accidents involving tankers, for example.

High pressure water mist in buildings

With up to 75% less water consumption than a conventional sprinkler system, the AQUASYS HPWM system is also superbly suited to fighting fires in everything from historic buildings to modern skyscrapers. The limited amount of water used considerably reduces the risk of water damage. Moreover, small piping and less water storage are needed. In high-rise complexes, the water can be pumped to the top floors using a central pump station in the basement, without additional pressure boosters. HPWM wall hydrants provide additional support in the initial firefighting stage. A 30-storey high-rise complex in the heart of Tallinn, with offices, apartments, kitchens and server rooms as well as a car park underneath, is now protected with a highly efficient and space-saving fire-safety solution from AQUASYS rather than the originally planned combination of sprinklers, wall hydrants and a gas extinguishing system.

▲ 30-storey high-rise, existing and new buildings safely protected with HPWM.

Typical industrial applications

It is important in industry to keep production lines running and ensure equipment availability even in the event of a fire or false alarm. An especially reliable and robust firefighting system is called for.

When operators in the industrial and power plant sector use an HPWM system to protect their machines, equipment, test facilities, production areas and laboratories, they also reduce the risk of downtime due to process contamination and consequential damage.

Austrian technology group voestalpine, for example, uses water mist to protect its hydraulic areas, transformer stations and main power-supply cable tunnel. The very rapid effect and low risk of consequential damage represent considerable added value for this innovative company and, among other things, make it easier for the in-house firefighting team to safely approach the source of any fire. This means better protection of the key infrastructure, so equipment can be kept running.

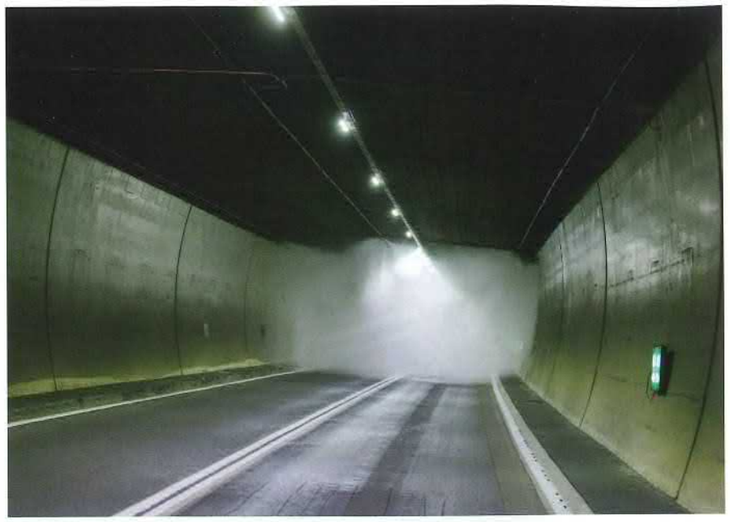
'The installed empty pipes based on water mist enable the voestalpine Standortservice GmbH plant fire brigade to fight fires quickly and efficiently, while at the same time ensuring the highest possible level of safety for the emergency personnel,' confirms Michael Linninger, voestalpine Stahl plant fire brigade, Linz.

Semi-stationary systems as support for company firefighting teams

Semi-stationary systems are suitable for protecting large-scale industrial plants, provided that a fire service (such as an in-house firefighting team) is available at short notice. In the case of such systems, only the nozzle lines are laid in the protection zones. These are not connected to a 'stationary' pump unit, however, but to an easily accessible feed connection point. Due to the low water consumption, high-pressure water can be supplied in the event of a fire via a mobile high-pressure pump unit integrated into a firefighting vehicle. Semi-stationary systems not only offer a high standard of fire protection but also represent an affordable alternative to fully stationary automated systems. However, the aforementioned mobile high-pressure pump unit must always be available at a moment's notice.

High-pressure water mist for transport infrastructure

Through its years of continuous research work, AQUASYS has also become a firefighting expert in the transport infrastructure segment. When it comes



▲ Road tunnel in Arlberg, Austria.

◀ The AQUASYS team is ready for your challanges!

to road and rail tunnel applications in particular, all of the benefits of high-pressure water-mist technology can be fully exploited: high efficiency, good ambient cooling, smoke suppression and the washing-out of toxic gases facilitate the evacuation process, enable emergency service access and avert damage to the tunnel structure. This can prevent tunnels being shut down for months and increase user safety.

The outstanding cooling effect of the HPWM technology is also suitable for the targeted cooling of smoke gas in ventilation and extraction systems.

Engineer Lukas Heschl adds: 'One special application is the protection of passengers in rail vehicles, especially in underground sections where there is no easy way to evacuate in the event of a fire. Such situations call for systems that meet the requirements of rail vehicle manufacturers and operators – low weight and compact dimensions as well as easy maintenance – and have been proven in real fire tests to handle various fire scenarios with a minimum of water.'

AQUASYS is synonymous with individually designed systems and manufacturing flexibility

Every HPWM system is tailored by AQUASYS to the customer's specific needs. Real fire tests for normative, standardised applications and the willingness to conduct project-specific fire tests at short notice are the basis for producing systems that are ready for acceptance.

AQUASYS demonstrates these capabilities throughout the world on a daily basis, together with a trained partner network.

- In contrast to conventional firefighting systems, the AQUASYS HPWM system can be adapted very flexibly to reflect changes in ambient conditions. Accordingly, wide-ranging modifications can be carried out at a future point without having to replace the system.
- Thanks to the modular design of the standard components and flexibility in our manufacturing process, we can easily accommodate even specific and challenging customer requests.

The entire system's high degree of flexibility and low weight as well as the finest degree of misting, capable of protecting even concealed areas, are conducive to implementing custom concepts, such as systems protecting chassis dynamometers or parking and conditioning areas in the automotive industry. Such systems require testing based on fully realistic scenarios. The technology has been further developed in recent years and new scenarios are tested on an ongoing basis. As a result, it is already possible to take into account completely charged battery packs in multiple applications.

Future requirements in respect of modern fire safety: an outlook

'Parallel to the advancements in all kinds of industries in our daily lives, requirements and demands in respect of further fire safety innovation are increasing.

'The use of vehicles with lithium-ion batteries or hybrid vehicles, huge server farms for the digitalisation of our lives and the demand for permanently available road tunnels and critical production facilities, as well as the general increased focus on occupational safety, are just some of the key drivers of this! In all of these situations, the goal in respect of firefighting technology is to contain fires the moment they break out, while maintaining a safe environment directly around them. High-pressure water mist has proven a reliable technology in recent years and is playing a major role in increasing safety and helping our customers to achieve their financial goals,' explains Managing Director Josef Hainzl.

If you require further information on the use and operating principle of AQUASYS HPWM technology, our team of specialists and technicians with many years of experience would be happy to assist you.

For more information, go to www.aquasys.at