Water Mist applied

It all started with marine and offshore applications. However, for many years water mist systems have been installed in buildings on solid ground. When it comes to the different classes of fires, water mist ticks more boxes than any other kind of fire suppression system. This is due to the smaller droplets that interact with the fire in a different way compared to interaction between a fire and the larger droplets coming from traditional sprinkler systems. Water mist systems deal with heat and oxygen, whereas sprinkler systems can only deal with heat. This is reflected in the list of applications that – over the years – has grown to considerable length.

One typical area is the health sector. Hospitals, health centre, care homes. Derek Killaspy, managing director of Fireworks Fire Protection and IWMA (International Water Mist Association) member, explains: “While fire sprinklers have been the traditionally chosen solution in the past, we saw the beginnings of the transition to water mist fire protection around a decade ago. Private clinics were amongst the first to benefit from the superior life-saving properties offered by water mist. Many large hospitals around the world are following suit, especially now that total cost of ownership over the lifetime of the system has become more competitive.“

One hospital which is equipped with a water mist system is the VUmc University Medical Centre in Amsterdam, one of the largest high-pressure water mist projects in the Netherlands. Provider of the system is the German company Fogtec (also an IWMA member). Rüdiger Kopp, Fogtec’s managing director fixed systems, says: “We believe that high-pressure water mist offers the best fire protection for the hospital environment. Two points in favour of this technology are the high cooling effect and the minimal water usage. The result is an easy evacuation in case of a fire and limited fire and water damage to the valuable equipment and the building”.

Particularly in retrofit situations to existing hospitals, the small pipe diameters and reduced water storage requirements render a flexible and space saving installation of the system possible.

In 2020, the installation process started. The system was selected as an integral part of the buildings' engineering scheme to lift the hospital complex' fire safety concept to the highest level. It was installed while the medical centre was in full operation, which means that installation works were carried out while patients were taken care of and doctors, nurses and students were on duty.

Special installation concepts had been developed by Fogtec to ensure as little interference as possible to the daily routine in the hospital. The use of flexible high-pressure stainless-steel hoses in conjunction with high-pressure press fittings reduces the site presence to a minimum and guarantees a quiet and clean system integration.

Once the installation will be finished, the Fogtec system will protect more than 43,000 square metres of nursing rooms, public spaces, escape routes, technical areas and car parks. It will – in case of a fire – provide safe evacuation conditions, protect valuable assets and assure operation continuity of the university hospital.

Two further, nowadays typical and common applications are the protection of archives and electric power plants.

One famous archive which is protected with water mist is the Bodleian Library at Oxford University. Another example: the Hubei Provincial Archives. They maintain the province's collection of nearly one million extremely valuable books, paintings, calligraphies, and other historical documents – many dating back to the Ming Dynasty. "When the government built the new 60,000 square-metres building to house these very flammable treasures, the responsible engineers selected amongst others Danfoss PAH (Pump Axial-Piston High-Pressure) pumps to power our advanced high-pressure water mist fire suppression system" says Amin Hadian, application manager at Danfoss High-Pressure Pumps.

The focus lay on providing a compact, reliable, simple to maintain high-pressure water mist system that would protect these historical treasures. Because the collection is largely paper-based, engineers from fire-suppression specialist HeFei KDLian proposed installing a water mist system, which reduces water damage significantly better than traditional sprinklers.

Amin Hadian explains: “For this project, high-pressure pumps by Danfoss were definitely part of the solution.” Based on project requirements and positive past experience with Danfoss products, the HeFei KDLian engineers specified 85 PAH 80 pumps to provide misting pressure. They also selected Danfoss solenoid, check, and pressure relief valves.

Amin Hadian summarizes: “The installation went ahead smoothly, and the archive was opened in 2021. Since then, the suppression system was, fortunately, not in use. However, regular maintenance and security checks have been carried out according to plan so that it will function if it has to”.

Another project is one by EmiControls. Deputy CEO Francisco Fritz explains: “Since 2020, we have equipped numerous transformer stations at electric power plants throughout China with water mist turbines. One of them was a substation in Zhejiang province.”

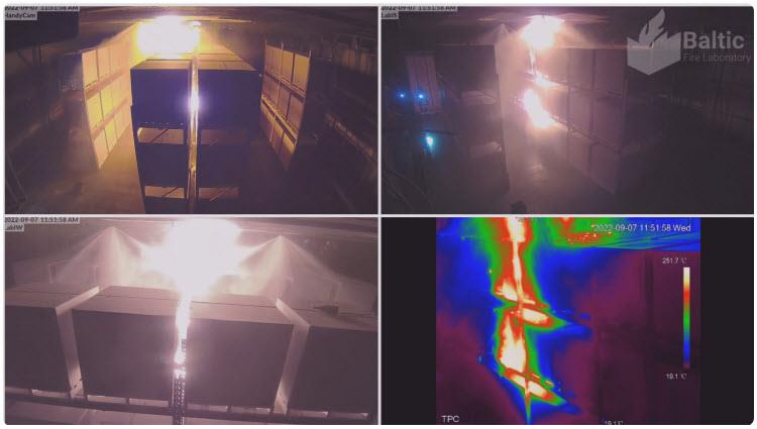
EmiControls firefighting turbines produce microscopic, none-cohesive water droplets, which cannot conduct electricity. Hence, twelve FT10e firefighting turbines could be installed in a substation in Zhejiang province, each one protecting two transformers, of which the plant houses a total of 24. The turbines are placed on 8-metre-high towers, protecting an area of 35 metres in diameter. If activated, water mist is sprayed from high up onto the transformers below, which ensures an optimum coverage of the burning surface by reaching all hidden spots and prevents the fire spreading to other transformers or the entire plant.

Francisco Fritz says: “The detection system is automatic. As soon as the alarm is triggered, the turbines start extinguishing with 600 litres/minute and a pressure of 12bar. The foam proportioning rate is 1 to 3 per cent.”

During real-size validation tests the system extinguished a burning transformer within 30 to 40 seconds. In phase one, water mist helps to keep the temperature low. When a transformer catches fire, it must be extinguished quickly to avoid injuries and blackouts of entire city districts but also to keep material damage as low as possible.

Of course, in most cases, what is protected are lives, properties and jobs. In other cases, it is seemingly small things like labels on wine bottles. “But if that is your business, it is also your livelihood”, says Bettina McDowell, IWMA general manager. What some people may not be aware of is that valuable bottles of wine – which may cost thousands of euros – lose their value if the label is flawed by – for example – activated sprinkler systems that can impair or even wash labels off wine

bottles. In this case, IWMA member BFL Baltic Fire Laboratory was contracted by Ultra Fog – also a member of IWMA – to check nozzle capacity against storage racks with a very high fire load. The end customer had already experienced more than one fire incident including exactly that kind of loss and wanted to make sure that the loss through water damage would not outweigh the loss through a fire incident and also that if one rack of bottles was affected by a fire the one next to it would not. To validate the damage on goods, the Baltic Fire Laboratory suggested making the test more realistic by placing a bottle of wine in the rack next to the burning one to make sure it did not explode due to heat exposure (which it did not) but also to make sure the water would not wash the label off the bottle (which also it did not happen).



Fire test with wine bottles (copyright: The Baltic Fire Laboratory)

The aim was to design a protection for a medium-sized storage with a height of 5.25 metres. The Baltic Fire Laboratory (where the test was performed in August 2022) used – as a base – FM 5560 HC-2 with the difference that the storage height was slightly changed to three instead of two racks.
The data and conclusion that could be drawn from this test underlined the colling effect and radiation shielding water mist provides.

Other applications include for example heritage buildings, tunnels, data centres as well as the protection of shopping malls, trains, train stations and hotel rooms. These diverse settings share a unique need for the features only water mist systems can provide. Over the years, speakers at the International Water Mist Conference have introduced their projects: The Spanish Congress Palace in Madrid, the Hungarian Parliament in Budapest, St. Mark's Basilica in Venice and St. Patrick's Church in New York. They talked about safeguarding escape routes in high-rise buildings, about the protection of industrial oil cookers, saunas and wooden churches and sensitive roof structures.

"It will be interesting to see what topics will be submitted for the 22nd International Water Mist Conference", says Bettina McDowell. This event will take place in Copenhagen, Denmark, on 11th and

12th October 2023. The conference hotel will be the Copenhagen Marriott. The call for papers will be released on 1st February, the deadline by which abstract should be submitted and the date from which onwards delegates can purchase their tickets s 15th May.

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