

WATER MIST

HOW DOES IT WORK? WHAT CAN IT PROTECT?

An important narrative from International Water Mist Association (IWMA)

Punctuated with specific inputs from Ms. Bettina McDowell



Fixed water mist firefighting systems are well established and have been in use for nearly 30 years in their present stage of technology. However, there are still people involved in fire protection who are unaware of the many beneficial advantages this technology has to offer.

To explain how water mist works is easy. A fire needs three elements to add up to a fire triangle: the combustible material or fuel, the heat and the oxygen. Water mist reduces two of these elements: the heat and the oxygen. It interacts with the flames in a way that suffocates the fire. If a fire breaks out water mist attacks it by spraying water through nozzles especially designed for this purpose. The higher the system pressure, the smaller the droplets. And the smaller the droplets the larger the overall surface.

The mist is pulled into the fire where the droplets – due to the heat – evaporate and due to the enormous increase in the volume of the water droplets (as they evaporate) the oxygen is displaced at the source of the fire and the fire is extinguished. During this process, the oxygen content around the fire (and only there) is below 21 %. It is in fact this low oxygen content that suffocates the fire. This is called the local inerting effect. Further away from the fire, the oxygen content

is above 21 % which means that there is enough oxygen available for humans. A bonus is the additional cooling effect that prevents re-ignition. Yet another bonus is the fact that water mist is a performance-based technology and a system is always a bespoke system based on a real-scale fire test.

When it comes to the definition of the different kinds of water mist systems two approaches exist. NFPA 750 and FM 5560 argue that there are three categories, Vds 3188 suggest that there are merely two.



The NFPA 750 and FM 5560 approach says: low pressure systems work with a pressure below 12.5 bar (or approx. 181 psi). High-pressure systems work

with a pressure above 35 bar (or approx. 507 psi). Systems ranging between these two figures are defined as intermediate pressure systems.

The VdS guidelines 3188, on the other hand, divides the technology into merely two categories: low pressure systems that remain below 16 bar (or approx. 232 psi) and high-pressure systems that exceed 16 bar.

Once the first question is out of the way the next question usually is: where can water mist be applied? The answer to this question is just as easy: water mist should not be used when burning metals, e.g. magnesium, are involved. And some people are of the opinion that water mist is not suitable for warehouses and storage areas. But what other applications are there? The answer: tunnels, offices, car parks, saunas, hospitals, care homes, atriums, churches, museums, archives, libraries, cable tunnels, power stations, machinery spaces, escalators, data centres, hotels, aircraft hangars, car parks, schools, high-rise buildings. When it comes to the marine and offshore sector, water mist protects amongst others passenger ferries, container ships and oil rigs. Over the years, speakers at the International Water Mist Conference have talked about the protection of concert halls, train stations, the printing and food industry, historical buildings, government buildings, department stores, laboratories. Water mist systems have been installed in the Hungarian Parliament in Budapest, the Clock Tower in Mecca, the "Elbphilharmonie" in Hamburg, Germany, and La Scala in Milan, Italy, as well as St. Patrick's Cathedral in New York and the Eurotunnel which connects the UK to the continent. They protect old wooden churches in Scandinavia and modern buildings made from brick, glass and steel all over the world. Even NASA have chosen water mist. The International Space Station (ISS) is equipped with portable water mist extinguishers.

As less water is needed the technology is a good choice for regions like the Middle East where water is scarce and therefore precious. Using less water also reduces the danger of extensive water damage. In case of a fire, valuable paintings in museums must of course be protected from fire but also from water which makes clear: Water mist is not a compromise but the solution.

Less water also makes water mist systems cost effective. Apart from that, water mist systems are reliable, environmentally friendly, they do not cause ozone depletion and they do not contribute to global warming. *Ms. Bettina McDowell, IWMA's general manager explains: "On top of this, they do not harm

human lives. They can be activated directly unlike gaseous systems, there is no fear factor. People do not have to be evacuated from hospitals, care homes, residential buildings, workplaces before activating the system."



Furthermore, water mist systems give architects the freedom to be creative. Especially high-pressure systems are often applied in special purposes and unusual hazards. The core is the engineering approach. There are no prescriptive standards. The solution lies in the performance-based approach for completely new and out of the ordinary projects. And these kinds of projects exist all over the world. There is for example the Credit Valley Hospital in Mississauga, Canada, or the Isala Clinics in Zwolle, The Netherlands, where high-pressure water mist systems have been installed. And with high-pressure water mist this usually incorporates the development and production of special components. On the other hand, there are low pressure water mist systems. *Bettina opines further "With low pressure water mist it is possible to use more conventional system components which can be sourced locally and which in the end reduces costs and saves time."

Apart from fixed water mist systems there are also mobile systems such as lances or nails and of course, as already mentioned, fire extinguishers. With lances and nails, one field of action is the marine sector. In 2013, it has become mandatory to carry water mist lances on board of new container ships constructed after 1st January 2016.

The forum which unites manufacturers, distributors, insurance companies, independent institutes, installers, architects, fire consultants etc. is the International Water Mist Association (IWMA). The organization was founded on 4th April 1998. The first two years were a phase of initiation during which the then few members merely worked together on joint research projects and established a first working group which collected

existing guidelines for standardization worldwide. It was a time of casual exchange of thoughts and ideas, but as time went on the plans became more palpable.

At the beginning of the century, things started moving and in April 2001 the 1st International Water Mist Conference (IWMC) was organized in cooperation with Factory Mutual Research from the USA, the Norwegian Fire Research Laboratory SINTEF (now RISE Norway), the Swedish Testing and Research Institute SP (now RISE Sweden) and the Finish Institute VTT.

*Ms. McDowell goes on to mention that “The purpose of the event, which took place in Vienna, Austria, was to introduce IWMA and to put water mist on the map of the firefighting market. The aim was also to show that the technology is not an auxiliary technology but a sufficient and completely independent method to extinguish fires or to keep them under control.”

At first, water mist and consequently IWMA were met with scepticism and even open opposition. Many things have changed since then mainly due to learning processes and turning points. One of these turning points was a research project sponsored and organized by IWMA on “The Scaling of Fire Suppression Characteristics in Machinery Spaces” carried out by SINTEF on behalf of IMO (International Maritime Organization). The presentation of the outcome at IMO in London in February 2009 was a key event for IWMA. Another important milestone was and still is the opportunity to support the European Committee for Standardization, thus to contribute to the CEN-guidelines. Nowadays, IWMA hold a liaison with CEN and also support the European Commission (Expert Group on Marine Safety). With IMO IWMA hold a consultative status. IWMA representatives also support amongst others the work on NFPA 750, NFPA 25 and the VdS guideline 3188.

All this has happened and is still happening over one hundred years after the idea about smaller droplets fighting fires first emerged. Back then, in 1880, the US-American company F.E. Myers manufactured a backpack system incorporating a lance to fight small forest fires. Nearly 40 years ago, the ban of halon paved the way for water mist. Halon left a gap that

water mist filled. Another event which levelled the way was a devastating fire on the “Scandinavian Star” in 1990 that killed 158 people, nearly 50 per cent of all passengers on board. The fire led to an improvement of IMO’s fire safety requirements and installation guidelines as well as to the development of fire test procedures for alternative sprinkler systems. There had already been a good deal of development on high-pressure water mist in Sweden since 1975. Two objectives had been the protection of hotels rooms and passenger cabins. After the fire on the Scandinavian Star the results of this work were presented and resulted in the founding of the first two water mist companies: Ultra Fog and shortly after that of Marioff. Both companies are members of IWMA.



The two Swedish researchers that have developed water mist as we know it today are Krister Giselsson and Mats Rosander wrote in their book ‘Fundamentals of Fire’: “In future, a liquid, e.g. water, atomized to drops smaller than powder grains will be the most important extinguishing agent against flames indoors, so-called fine mist.”

Water mist has come a long way. Many sprinkler companies have added water mist to their portfolio. The next big step will be the publication of the European Standard EN 14972 which can also be adopted and used in countries outside of Europe.

The next International Water Mist Conference (edition 21) will take place on 21st and 22nd April 2021 in Warsaw, Poland.

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Bettina has been working for IWMA since 2012 and determines – together with the IWMA board of directors – the overall strategy of the organization. Many of her articles on water mist have been published in journals worldwide. Bettina also gives presentations to educate interested parties about the advantages of the water mist technology.