



WHAT YOU NEED TO KNOW ABOUT WATER MIST

- Ms. Bettina McDowel

Based on one of the Webinar presentations by the author on an IWMA Platform

Introduction:

“A fire triangle comprises of three elements - the combustible material or fuel, the heat and the oxygen. Water mist reduces two of these elements viz. the heat and the oxygen.” These were the words with which Ms. Bettina started her presentation at the 1st IWMA webinar on “Firefighting with Water Mist”. The event took place on 15th October 2020 and was the first of a series of three.

She went on to explain what happens if a fire breaks out and a water mist system is activated? The answer is: Water mist attacks the fire by spraying water through nozzles especially designed for this purpose. The type of nozzle together with the system pressure determine the size of the droplets. And the smaller the droplets the larger the overall surface. The droplets evaporate and turn into steam and thus the system reduces the temperature and the oxygen. In consequence, energy is taken away from the fire and the additional cooling

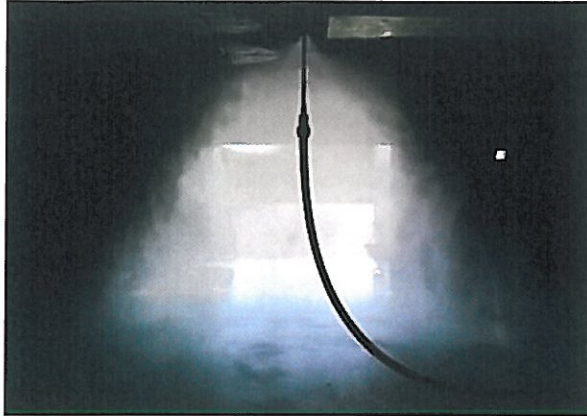
effect prevents re-ignition.

Due to the enormous increase in the volume of the water droplets 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 12%. It is 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 12% which means that there is enough oxygen available for humans.

Water mist is a performance-based technology! What is the significance of this? Answer: You will always get a bespoke system for your application. Water mist is not a “one-fits-all” concept. Any system is based on full-scale fire tests.

According to NFPA 750 and FM 5560, low pressure water mist systems work with a pressure below 12.5 bar (181 psi). High-pressure water mist systems work

with a pressure above 35 bar (507 psi). Systems ranging between these two figures are defined as intermediate pressure systems. However, the VdS guidelines 3188 divides water mist systems into merely two groups: low pressure water mist systems that work with a pressure below 16 bar (232 psi) and high-pressure water mist systems that work with a pressure above 16 bar.



What needs to be added is that – when it comes to low pressure water mist systems – sprinkler components can be used since they are much closer to traditional sprinkler systems,

There are fixed systems, fire brigades use water mist, there are water mist fire extinguishers, there are water mist lances, guns, turbines and trolleys.

When it comes to the benefits of water mist, the diversity must be underlined. A water mist system produces very small droplets. As a result, we have a suppressant agent that is applicable on a broad range of fire types. The reason for this is that the droplets turn into steam. This does not happen with sprinkler systems.

Another aspect is the eco-friendliness of water mist systems. In the world we live in this is an important aspect. Technologies that are sustainable and environmentally friendly do not put pressure on nature and are vital and essential.

Now what makes a water mist system eco-friendly? First of all, a water mist system obviously uses water and what is more natural than water? And then a water mist system also uses less water. Apart from that you have less material due to smaller pipes and if the nozzles are connected to a tank rather than the mains this tank would obviously be quite small and need a relatively small amount of space. What needs to be pointed out is the longevity of systems due to stainless steel components (i.e. if stainless steel components are used. Sometimes galvanized or plastic pipes are used, but stainless steel is recommended for all components that come into contact with water) Plus there is the reduced water damage which means that after a fire

there is less of whatever that has to be disposed of which could also result in less downtime for businesses.

The summary of advantages would read like this: Less water causes less water damage, less water means lower cost, there is the environmental aspect, water mist reduces the heat and the oxygen and it does not harm human. Water mist systems are easy to retrofit and especially when it comes to historic buildings clients often ask for effective but also invisible systems and water mist manufacturers cater for that. The cooling effect prevents re-ignition and the technology is proven to international guidelines and standards and is therefore ready to use. Water mist systems are cost effective, flexible, reliable and versatile. And for every water mist system there is a DIOM-Manual. The letters DIOM stand for design installation, operation and maintenance.

Different as for sprinkler and gas suppression systems, water mist standards and guidelines are not prescriptive. The performance of water mist systems has to be validated in application-related full-scale fire tests. Fire test scenarios and acceptance criteria are pre-determined by protocols within the standards and guidelines. Fire tests have to be certified by accredited laboratories. Water mist components have to be tested just like sprinkler and gas system components. Manufacturers' specific fire and component test results are summarized in their DIOMs which they hand over to the customer.

The first water mist standards for land-based applications were published in 1995 (FM 5560) and 1996 (NFPA 750). They are continuously revised. There are also UL 2167 and VdS 3188. And quite early on, also the International Maritime Organization (IMO) had in two steps decided to back water mist as the fire suppression / extinguishing system on board of ships and to rule that container ships must carry water mist lances on board.

prEN 14972: For manufacturers based in Europe the most important standard is EN 14972, the European Standard. Part one was published on 23rd December 2020. This document specifies requirements and gives recommendations for the design, installation, inspection and maintenance of all types of fixed land-based water mist systems. CEN members have until 30th June 2021 to implement EN 14972-1:2020 as a national standard, either by publication of an identical text or by endorsement, and withdraw any conflicting national standards.

Some famous buildings that are protected by water mist systems are St. Patrick's church in New York, La Scala in Milan, the archive at the Bodleian Library at

Oxford University, the Clock Tower in Mecca and the Elbphilharmonie in Hamburg. Also, the Eurotunnel which connects Great Britain to the continent, is protected with a water mist system and so is the International Space Station ISS.



What is interesting is that water mist was actually first re-launched in the 1980s as an alternative to firefighting systems in marine applications! This brings us straight to the history and the roots of the technology. It was in 1880 when a water mist backpack system was developed to fight small forest fires. Between then and the late 1970s there were only very few initiatives to further develop the technology. In 1978, two Swedish scientists, Krister Giselsson and Mats Rosander, published a book entitled "Fundamentals of Fire" and they wrote "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."

When it comes to the beginning of the success story of the technology, there is the Montreal Protocol on substances that deplete the ozone layer. The roots of water mist, as we know it today, are a result of the phasing-out of halon, a bromine based chemical fire suppression agent that did deplete the ozone layer. And ban left a gap which was filled with water mist.

And then, as it is often the case with technologies within areas like fire protection, it takes a catastrophe to create progress. The fire on the passenger ferry "Scandinavian Star" in April 1990 killed 158 people, nearly 50 % 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. The main objectives had been the protection of hotel rooms and passenger cabins as well as research into flammable liquid hazards. After the fire on the Scandinavian Star the results of this work were highly sought after and the researchers were asked to present their findings basically straight after the fire. This led to the founding of the first water mist companies: And the rest is history.



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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.