RISCAuthority Webinar: Watermist – Why it's complicated!

This webinar took place on 24th March and a number of questions were posted during the session. Please find below the answers provided to each question.

Question Asked	**Answer (JG)**
Can you please advise any difference between high and low pressure mist in terms of water requirements, fire suppression and extinguishing	A good question, and like everything else to do with this subject not uncomplicated. Water pressure provides the energy to break up droplets. To carve water up into the tiny droplets demanded of WM systems takes a lot of energy and this is why many systems are high pressure. The downside to this is that high pressure systems can have nozzles with very small orifice (<1mm) and these can be easily blocked if the water supplies are not fastidiously clean. Additionally, as I mentioned in the webinar, there are many 'repulsive forces' around a fire. The ability of a droplet to penetrate a fire depends upon its momentum – the multiple of mass x velocity. For very small droplets good momentum can only be achieved by having high velocity = high pressure. Low pressure systems are becoming increasingly populate because the are less complex, can tolerate lower quality water, and may well be more resilient and cheaper as a result (the systems we produce for warship protection are low pressure). The disadvantage is that they may use more water (have larger droplet diameters), but the momentum associated with the additional mass can have great advantages for fire penetration, surface cooling, and foam delivery, and use from higher ceiling heights – all weaknesses of high pressure systems. In short, water quality is less of an issue for many low pressure systems

	and complexity will be less, but you may need to use more water. This raises the interesting question of – how much water is too much when considering consequential damage. If you have an answer to that please let me know!
Is it possible or would it be beneficial to install a traditional sprinkler system alongside a watermist system to offset some of the weaknesses of watermist?	A more common mix of technology is to combine water-based protection systems with the provision of i.e. a gaseous agent. The need to do this is normally driven by the reduction of consequential damage and what you are trying to save. For example, in an electronic environment it is generally good to not throw down water except as a last resort. The provision of a gas system gives the opportunity to extinguish a fire with low damage consequence and negate the need to lay down water. However if the gaseous system fails for any reason (failure or lack of compartmentation), the water system is available to save the day with greater loss (It is always easier to recover from water damage than fire damage). Short answer is yes it can be done, but need to ensure that a single point of failure (need for pumps or water) will not derail the function of both options.
Thanks for sharing knowledge with us. My question is about maintenance. I have seen some watermist nozzles presenting some signs of a green corrosion or moisture in the small orifices (I do not know what it really is). What would you recommend to the customer in this case? Is the nozzle compromised?	This is a very common issue and may come down to water quality and testing. The internal architecture of high pressure watermist nozzles can be complex and very small. They can both retain water after a test firing, and be impaired by normal hard water deposits crystallising out. In our laboratory it is not uncommon for us to shut down on a Friday, to return on a Monday to find nozzles with impaired discharge (this is an abnormal way to operate a system obviously because rigorous clean-down,

	blow-through, and drying would normally be conducted post discharge – but it highlights the sensitivities). If the system is new and has never been fired then there is a leaking seal. This requires urgent attention as it can act to cement the valve in place over time if it has one. In a residential type system this might mean the bulb may well break, but the values stays in place and water does not come out. The fact you mention moisture means it sounds like a leak – the head needs replacing immediately, or if an 'open system' the near actuation valve.
Can i ask your thoughts regarding modular systems for residential high rise premises as ADB focuses on BS9251 thank you	There are some nice systems around for high-rise applications but we are aware with problems to do with both incorrect installation, and poor design, that have lead to some very bad escape of water events. These are very costly in the high-rise environment and more to the point damage the reputation of suppression systems which is hard won. Look to systems with good approvals and product certifications, and make sure the system is installed by a certified installer. PS – we have also seem some shocking BS9251 sprinkler systems being installed also – good companies can do good things.
what factors would you consider if specifying a mist system over a sprinkler system for domestic use	A big question that really needs narrowing down to the application - The crucial element is to consider what you are trying to achieve. 1. Life safety 2. Building Regulations Compensation 3. Property / business protection / continuity There are no legal requirements for property protection – if you want this then you will need to ask for it and the

	system will need to be specifically designed (i.e. LPC/FPA Rules for Automatic Sprinkler Protection). You need to also consider whether you are protecting a building / property, just a space within the property, or the people within the property. Residential sprinkler and watermist system are designed to 'buy-time' so that in the race between structural building collapse during fire and safe evacuation – the occupant wins the race. Commercial / property protection systems must achieve whatever challenge is set – typically to contain the fire, prevent spread, allow the business to continue trading following less-than-critical damage. Aside from this it is also important to play to system strengths. The weaknesses of watermist are high ceiling heights, large compartments, ventilation, small fires and deep seated fires. Sprinkler system are 'strong in these areas'
Are you compiling data on reliability? If so are/will they be available, If not should you or at least some else	Yes – every 25 years sprinkler heads must be tested to show that they can still perform (open at the right temperature, and dislodge the valve at the right pressure). There is now a requirement to do the same for watermist heads, but following many surveys and problems found, this needs to be done every three years. Many watermist heads use rubber o-rings, something long since banished from sprinkler head design as they are known to harden and 'glue' with time. Early days, but we are now testing and compiling data. We are not at statistically relevant levels yet but will

	be reporting back in due course. It's tricky because some problems may be specific to brand, others to 'abuse' of the head.
How would you approach the design of a supplementary smoke ventilation system in building design, say a basement plantroom? Approved Doc B and BS 9999 call for 10ACH mechanical extract, but I wondered if that should be approached or controlled differenently?	Smoke ventilation and water-based suppression systems need very careful consideration to co-exist. The only communication between a bulbed sprinkler head and the fire is the ceiling gas temperature. If you allow this to escape through ventilation, then the next needed bulb may not burst. I think the thing to question here is the use of bulbed heads. Might be better to use a drencher type system where the actuation is made by some other reliable form of detection to dissociate the harm that mechanical extract can cause to timely operation. There are advantages too – the extract will be cool, not hot.
Jim - can you talk a little about representative fire tests and how much interpolation you see where tests are not fully representative of final application please	Key things that need to be directly applicable to the end-use are: 1. Compartment volume 2. Ceiling height 3. Level of ventilation and how controlled 4. Fuel type / fire sizes Yes that is nearly everything and hence why generally WM systems require full-scale testing. Worst offending is using marine test to justify onshore usage.
The tests FPA conducted clearly demonstrated that where the water mist did extinguish fires it was by oxygen reduction mechanism. Did it reduce the heat release rate or kept consistent and controlled the fire size when it failed to extinguish the fire	The local dynamics around the fire are important and complicated. When the fire is at it's largest then the rate of steam generation may be greater than the rate of oxygen reintroduction leading to a lowering of the overall O2 availability. The fire will sicken, and may even go out. If it does not go out it may shrink to a point where steam production falls below the oxygen reintroduction rate, and it will recover –

	and it may repeat this cycling until the fuel runs out. So, yes, the fire is altered, but with it the ability of the watermist system that needs a healthy fire to generate steam.
If used in a commercial kitchen, can the water mist heads be blocked by grease in the same way that fire suppression heads can be and require plastic caps?	Yes – plastic blow off caps are not uncommon. They do present another challenge if they ever stick – recommend here the very good BAFE kitchen installer scheme that assures anyone touching the system has a Designer's level of knowledge from the OEM of the system.
And what about evaporative cooling from sprinklers at ceiling, preventing/delaying response of adjacent sprinkler bulbs?	Sprinkler are deliberately design not to cool the gas layer and very extensive testing was done in the early days to reduce the likelihood of head-skipping. This has been enshrined in current rules that determine the spray quality of the heads, distribution pattern, separation, and operating pressure. It is a big deal.
Will the British Standards be updated to make specific recommendation for Watermist?	There are now British Standards for both residential and commercial applications. FPA objected strongly to the publication of the Commercial Watermist Standard as we feel there are unsafe features within it.
Is there any thumb rule for assessment of water mist adequacy?	Good question – there is no concept of safety-factor. For a gaseous system there are a strict series of test that need to be completed to determine the 'Extinguishing' concentration. On installation an addition 30% of agent is added to make the 'Design' concentration to ensure deviations from the idealised tests are covered. 'Adequacy' depends on what you require it to do, and how reliably it must do that. Stick to watermist strengths – small enclosures, low ceiling heights, big fires, no ventilation, etc.

can low pressure mist systems be comparable to sprinkler systems?	It will depend up the application but the key differences in putting out less water will be: 1. Less wetting of uninvolved fuels 2. Lower surface cooling 3. Less resilience to ventilation 4. Less ability at high ceiling heights In the residential environment where essentially the remit is to provide alarm, stop flashover, and allow the occupant more time to escape or be rescued then they may well be comparable subject to being as resilient.
does the use of additives such as surfactants significantly increase the effectiveness of water mist ?	Interesting question and the work has probably not been done properly on this. I have found that foam increases droplet size which obviously leads to a reduction in surface area for heat and mass transfer – not a good thing. Again, in the topsy-turvy world of watermist – low foam concentrations worked best for us and for warship protection we use just 1% of a 6% concentrate. This allows for fuel security whilst maintaining small droplets. Surfactants, other than FF foams I have never tested explicitly.
Would you consider misting system in preference to sprinklers foe a domestic 4 storey victorian terrace where the staircase is no longer protected due to open spatial design?	Possibly reasonable, but it will be there for life-safety and buying time for evacuation only. Do not expect it to mean after everyone is out there will still be a house to go back in to.
thank you Mr Glockling, really informative and useful technical reminder of the comparisions with sprinklers.	You are welcome – interesting that if I talk about this down the pub how disinterested people can be!
no problems. Jim is a key and principle lead in the fire industry, so the quality of Ppt	Slides and recordings will be on the open area for the RISCAuthority website – thankyou again

info was excellent to hear and read.	
are these results on hight pressure or low pressure water mist?	The examples given in my slides were from a system running at 7 bar (apologies I think I said 14 in the talk)
are we moving towards a british standard	We have them … but I have some problem with the one on commercial systems.
preferable to co2 in an oven or enclosed fryer situation	CO2 is a very good agent but remember it is 'lethal' so use in enclosures occupiable by a person should be avoided. Oven and fryers? – probably depends on the need to remove heat, CO2 does not do this, watermist is very good at it. Heat can be controlled by interlocks on electrical and gas supplies and ventilation
What is the maximum open space (enclosure) that the mist system is suitable for?	Whatever size you have seen the system tested to that is representative for your application (and restricted to the test height also)
Sprinkler systems prevent fire spread until the fire brigade arrive. Is the expectation of the mist system to do the same or is it designed to extinguish?	Because so many factors can affect the system's ability to achieve extinguishment I would say that alarm, detection, and summoning of FB assistance is essential. Therefore water supplies should always be designed to be long enough for help arrival, rather than determined from a test that showed a fire could be extinguished in 30 seconds.
There are a number of asterix on the slides; are these significant for the points they highlight?	They were to prompt me to say something additional – there were already crowded slides and I wanted to limit even more text.
Is there an ACOP avalable including all the information included in the presentation?	This webinar was prompted by the RISCAuthority Suppression & Detection Working Group with a view to producing a warts 'n all guide to watermist for them and their customers. Work on this has started and will be available in around 4 months