Watermist Fire Protection for Datacentres

Today's datacentres aren't anymore the mainframes as we know them from previous decades!

It is this innovation and development why datacentres keep posing unique challenges for the fire protection engineer.

First, they will have to determine the objectives they want to achieve, when selecting the fire suppression system.

Protec the data or the facility?

As the data nowadays is more and more available in the cloud and physical stored in multiple servers in multiple locations. These objectives have been changing from data to facility protection.

Furthermore, they will also have to consider the infrastructure and configuration that will be applied when determining these objectives, such as the ventilation & cooling method used and the available space.

Is there enough space for a big cylinder bank and is it also feasible to get the rooms airtight to contain the agent long enough to extinguish a fire?

This requires the complete sealing of all walls, floors and ceiling slabs including doorways and openings.

Gas suppression solutions

Traditional fire protection for data centres includes not only gas suppression systems like halocarbons and inert gasses, but also sprinkler and watermist systems are used very frequently to protect large datacentre facilities.

With gas suppression systems you can expect that a fire is rapidly extinguished at a very early stage, providing protection for the facility, assets and employees.

So why look for another fire protection system?

Beside the high risk of an accidental discharges according to the Uptime Institute https://journal.uptimeinstitute.com/fire-suppression-systems-bring-risk/, the need to use expensive space for the storage of the gas cylinders, to shut down the ventilation and to build airtight rooms, also the size of the datacentre facilities is expanding and the relative cost to protect a datacentre with gaseous suppression systems increases to a point where it becomes economically unfeasible.

Water based solutions

Although the use of a water based system, such as sprinklers and watermist isn't without a risk as it requires a fire to break out before activation and collateral damage has often already occurred, many larger datacentre service providers are selecting it, as for them, the insurance companies and local AHJ's the loss of IT gear in a fire are acceptable.

Their main driver is critical infrastructure protection instead of zero damage to racks and cabinets.

Nevertheless, datacentre operators don't like the idea to have pipes with water above their server racks, which in case of a leakage or another incident could damage equipment and disrupt service.

For that reason, wet pipe systems are only used in areas they can't damage any IT equipment in case of an accidental damage or activation of a sprinkler or nozzle, as the piping is charged with water throughout to allow immediate application of water to a fire following operation of a sprinkler or nozzle head.

Pre-action systems are the most frequent used configuration in a datacentre, they will need two or more actions to occur before water is released into the piping.

In case that a sprinkler or nozzle is accidentally activated in a pre-action system, the loss of pressure in a piping that is filled with nitrogen or air will cause a low air pressure alarm. In this scenario, the biggest advantage is that no water is released, because the pre-action valve will be maintained closed unless an alarm from heat, smoke or flame detection.

This will protect critical infrastructure from water damage in case of an accidental damage or activation of a sprinkler or nozzle.

Previous watermist systems were designed for light and ordinary hazard occupancies, such as hotels and other similar commercial buildings and not specifically to solve the challenges posed by datacentres.

However, the last years watermist solutions have gain market over sprinklers and have been designed to meet the challenges and requirements of large datacentres, according to the specific test protocol of FM Global.

One of the biggest benefits over sprinklers, is that watermist systems requires less water and therefore less water storage space, smaller pumps and smaller pipes.

Another key benefit is that there will be less collateral damage during discharge since less water is discharged.

VID Fire-Kill

The VID Fire-Kill low pressure watermist datacentre solutions have been successfully full-scale fire tested and approved by FM Global to protect all critical areas of modern datacentres using a pre-action configuration and maintaining the ventilation during system discharge.

We are very proud to have designed a solution, with the robustness of a sprinkler system but with the same water consumptions than high pressure water mist systems but at a lower pressure and power consumption!

The FIREKILL™ system is approved to protect all areas of modern datacentres from server halls to special hazards.

1. Data Processing Equipment Rooms above and below Raised Floor
2. Offices, storage, Electrical Rooms and Circulation Spaces
3. Transformers and Generators

Water flow and droplets size - High Pressure Vs Low Pressure

One of the most misleading comparisons with high pressure watermist, is the water consumption and the evaporation of the watermist droplets.

It is thought that low pressure water mist consumes more water than high pressure and that after a fire in a data hall there is minimal water damage because all the water from the high pressure will be evaporated by the fire.

First of all, the evaporation of the water will depend much more on the intensity and the size of the fire then on the size of the droplet.

The advantage of the droplet distribution from the FIREKILL™ solution is that the nozzles are creating different sizes of droplets (average 200 - 300 micron) which are fighting the fire direct in the fire plume and by evaporation, causing an inert atmosphere around the fire. (The evaporation will only be in case we have an intense fire)

In any case will a fire size that can be found in a data hall not have any significant effect on the evaporation of the water droplets from neither low nor high pressure.

Regarding the water consumption I would like to make it clear that this is definitely not the case. As can be seen in the comparison below, overall, we have obtained almost the same results as high pressure in the fire test we conducted for the FM approval of our system.

Comparison above raised floor data hall solution

	VID Fire-Kill LP	Low pressure	High Pressure 1	High Pressure 2
Type	Pendent	Pendent	Pendent	Pendent
System	LP	LP	HP	HP
Water pressure	8 Bar	7,60 Bar	80 Bar	60 Bar
Min. Air pressure pre-action	5 Bar	5 Bar	25 Bar	5 bar
Spacing	3,60 m	3,70 m	4,30 m	4,00 m
Design number of nozzles	6	18	6	6
Design flow l/min	228 l/min	421 l/min	220 l/min	193 l/min
Max distance to ceiling	10 -135 mm	102 mm	100 mm	110 -215 mm
Minimum clearance to cable tray	1,07 m	1,75 m	1,75 m	1,25 m
Max operating area during tests	25 m2	164 m2	55 m2	32 m2
60 minutes operation	13,68 m3	25,26 m3	13,20 m3	11,58 m3
Maximum horizontal air flow	1,7 m/s	1,2 m/s	1,2 m/s	1,2 m/s
Maximum upward air velocity	1,4 m/s	1,0 m/s	1,0 m/s	1,0 m/s
Sprinkler comparison	EN 72m2/5mm/m2	FM Data Sheet 5-32 HC1 140m2 4mm/m2	FM Data sheet 5-32 HC2 230m2 8mm/m2	
60 minutes operation	21,60 m3	33,60 m3	110,40 m3	

(This is public information as it can be extracted from the approvals documents)

Furthermore, we definitely have obtained the best results for the above raised floor data halls solution as we have the smallest operating area, that means there can be less collateral damage during discharge, since less nozzles will be activated.

Many datacentre service operators are already using low pressure watermist solution for the fire protection of their datacentre facilities all over the world.

Beside the mayor cost and installation benefits of low pressure watermist due to the easier installation and the use of standard connections such as PN16 press, they are also using it as it can be combined with conventional sprinkler technology for the rooms for which there still is no FM approval for watermist in the market (HC2/HC3 risks) and creating a hybrid solution or just because water damage due to sprinkler activation is not of their main concern for certain rooms, such as offices, loading bays and storage areas.

With almost the same water consumptions but with lower power consumption and water pressure than high pressure water mist systems, the FIREKILL low pressure water mist system is the most cost-effective fire suppression solution for the fire protection of datacentres!

Visit our webpage for more information and to download our brochure or send me an email to recieve the specification from our solution or the slides from our last webinar on Innovative Watermist Fire Protection for Datacentres.

If you like you can also watch our recorded webinar. You can access the recording from that webinar and our datacenter animation using this link https://bit.ly/2K6JSxY

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