

Ultra Fog Fire Extinguishing System
vs. Traditional Sprinkler System

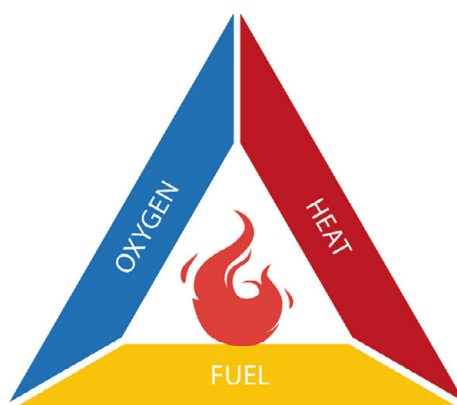
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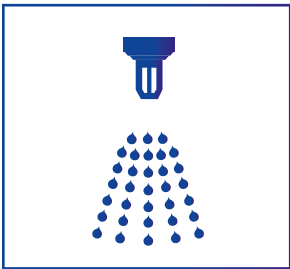
Introduction

Water has been very well known as a fire extinguishing agent for as long as man has used fire. Why is water so effective as a fire suppression medium? Water has a very high specific heat capacity - it can hold more heat than any other everyday liquid- this is why it is used in central heating systems in our houses. Fire can only exist when there are sufficiently high levels of fuel, oxygen, and heat to sustain combustion.

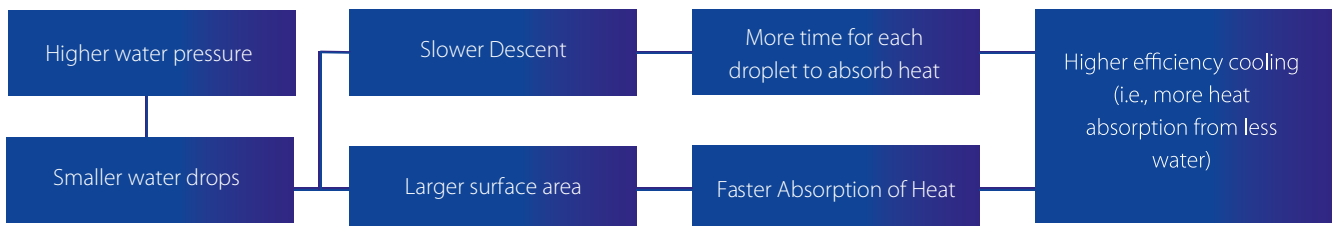
Automatic water sprinkler heads were commercially available since the mid 19th century. Still, the technology of high-pressure water mist evolved in the 1980s and 1990s. What was the reason behind this evolution? By comparing Traditional Sprinkler Systems and Ultra Fog Fire Suppression Systems, we will clarify the difference between both systems and explain the predominance of Ultra Fog Fire Suppression Systems.



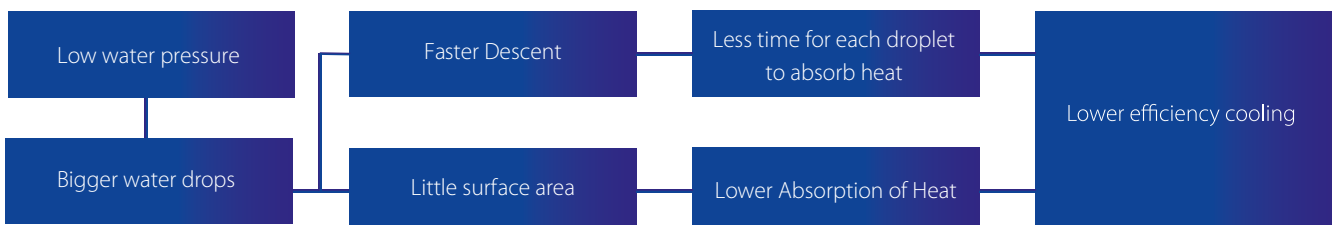
„Fire triangle“



Watermist Systems



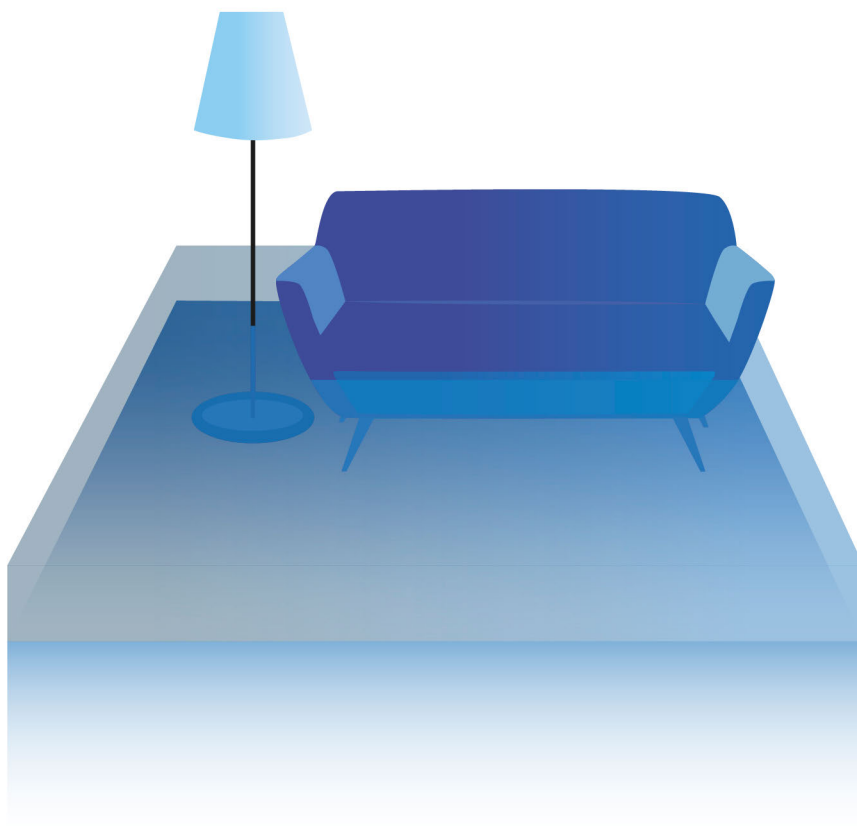
Sprinkler Systems



01. About Traditional Sprinkler System

Traditional Sprinkler Systems were available for commercial sale since the mid 19th century. They use water to perform, however, the form of water distribution is different than for Ultra Fog Fire Suppression Systems.

Sprinkler sprays are composed of droplets. The number of droplets of each size depends on the sprinkler design, water pressure and location in the spray. In traditional sprinklers, the typical diameter of each droplet is 1mm or larger. At that size, 1 litre of water produces approximately 1.9 million droplets, having a total surface area of 6m².

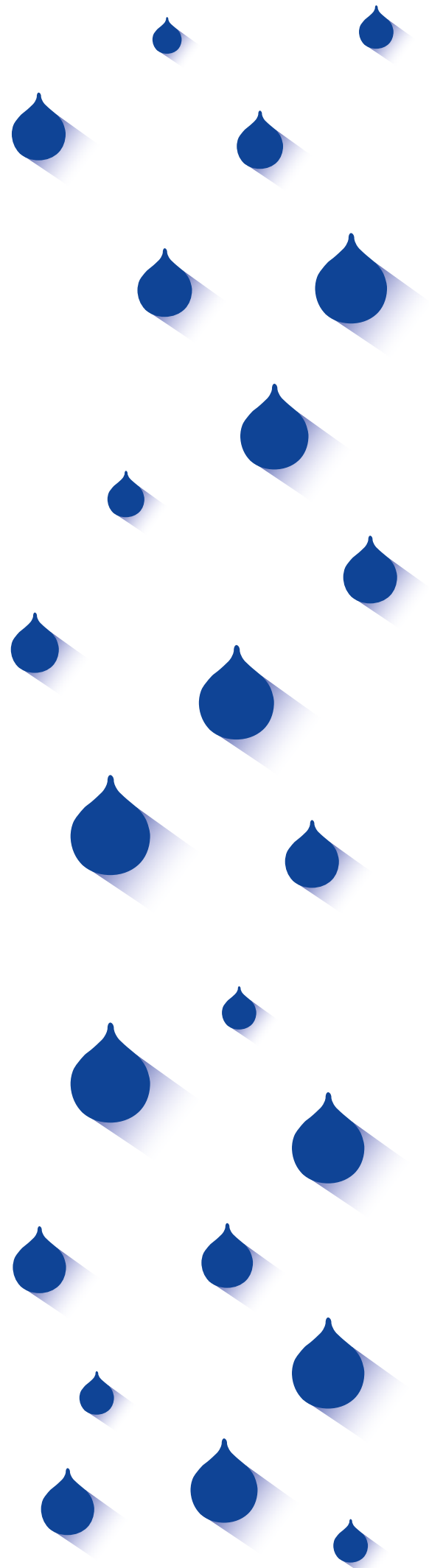


Traditional sprinkler systems suppress fires by saturating the room with large volumes of water, which then presents a risk of collateral water damage.

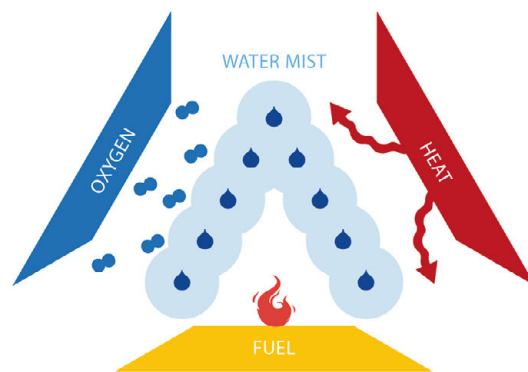
02. About Ultra Fog Fire Suppression System

Ultra Fog water mist fire suppression systems provide robust, effective, quality engineered solutions for applications that require optimal fire suppression while minimising the volume of water consumed and deployed. High-pressure pumps force water through the stainless steel Ultra Fog water mist nozzles, discharging the water in the form of millions of tiny droplets – typically 30 – 200 μm diameter. At that size, 1 litre of water produces approximately 4 billion droplets, having a total surface area of 75m².

An activated system creates a blanket of water mist droplets which maximise heat absorption from the fire, and subsequently displacing oxygen upon evaporation and expansion of the water mist as it converts to steam. Water mist systems are differentiated from sprinkler systems by mist's unique ability to present a much greater water surface area (enabling rapid heat absorption), combined with the mist's ability to remain suspended in the air for a much longer duration – thereby creating more exposure time for the heat absorption to take effect. This enables water mist systems to cool and suppress fire using considerably less water than sprinkler systems.



Water mist systems provide absolute protection for many kinds of enclosures. This occurs because the nebulised droplets and the oxygen present in the enclosure affect the base of a fire. When the water mist turns into steam, it expands in volume by 1700x, reducing the concentration of oxygen available to the flame. This process of evaporation is a consequence of the absorption of heat from the fire, thereby cooling the fire.



Water mist reduces two components of „fire triangle“.
Fire is not able to exist without sufficient levels of **oxygen** and **heat**.

The triangle-based formula for extinguishing fire also prevents a probable reignition. The smaller droplets of water mist create a much larger surface area for interaction with the hot, toxic gases released during pyrolysis. To a certain extent, the smoke is “scrubbed”, and smoke damage within the room can be reduced.

Small pipe dimensions mean lightweight and easy to install. A high-performance stainless-steel nozzle can cover up to 48 square meters. Wider nozzle spacing means less labour and potentially lower installation costs. Further to this, the patented design of the Ultra Fog nozzle provides a unique ability to test the system without breaking the frangible glass bulb, using Ultra Fog’s patented nozzle test tool.

03. Comparison

Water mist fire protection systems share many similarities with sprinkler systems. Both systems use water as the suppression medium, pumped through a network of pipes and zone valves, and deployed within the affected area via ceiling or wall-mounted heads. The main difference is the working pressure of each system. While sprinkler systems typically operate below 12 bar [175 psi], high-pressure water mist systems operate within the range of 35 – 120 bar [500-1740 psi]. Sprinkler systems typically work by drenching the surfaces of the fuel and surrounding surfaces; water mist systems work by rapid cooling of the fire via vaporisation of the water droplets into steam. The higher the pressure of the system, the smaller the diameter of the water droplets from each head. So, while a sprinkler system will produce droplets with a typical diameter of 1mm or more, ULTRA FOG® water mist systems produce water droplets with a standard diameter of 0.1mm. Why does this matter? The smaller the droplets, the faster the rate of heat transfer, and the quicker the cooling and suppression of the fire. Further to this, the smaller the droplet, the slower it falls from the ceiling to the floor. Thereby water must not only exchange heat more rapidly, but it also remains suspended in the air for longer and has more time to interact with the heat and smoke of the fire. This makes water mist highly efficient, to the extent that ULTRA FOG® water mist systems typically consume up to 90% less water than sprinkler systems.

Efficient use of water brings several benefits. A distinct advantage is the ability to use significantly smaller water tanks than sprinkler systems, and under certain jurisdictions, the water mist system's minimal water consumption may present an opportunity to connect the system directly to the main water supply, thereby removing the need for a storage tank. This opens the possibility for the architect or main contractor to utilise the space for other purposes, such as re-allocating the space for other essential services; or car parking spaces for the building's occupants.

Lower water consumption also enables water mist systems the use smaller diameter distribution pipework compared with sprinkler systems. ULTRA FOG® water mist systems typically utilise 12mm, 22mm, 28mm, and 42mm outside diameter stainless steel pipework. This saves space within ceiling voids – which are often shared with and occupied by the building’s HVAC, water main, drainage, lighting, communication, and power cable conduits. The use of small diameter pipe also simplifies the installation of the system and coordination of the pipework amongst the other services throughout the building. Pipes can be more easily cut, shaped, and handled onsite, without the need for extensive pre-fabrication.

Damage limitation is a further crucial advantage of water mist systems when compared with sprinkler systems. While the goal of both sprinkler systems is to suppress the fire, their use within domestic, commercial, and industrial buildings can result in collateral water damage. Sprinkler systems stop fires by drenching the affected space with high volumes of water to soak the fire’s fuel and its adjacent surfaces. Water mist systems contain fires by creating a shroud of mist around the fire, cooling the air within the affected space, and suppressing the fire by removing heat from the fire’s source. In addition to this, the exchange of heat from the fire to the mist causes the expansion of the fog, which displaces oxygen from the fire.

Under laboratory test conditions, water mist systems typically deploy 10-20% of the water of an equivalent sprinkler system. In the real world, this translates as less water damage within the building and its valuable contents. For this reason, ULTRA FOG® water mist systems have been installed within a broad range of sensitive structures throughout the world – ranging from medieval buildings of significant cultural value; to highly secure, ultra-modern military facilities.

In light of these significant technical and commercial benefits, water mist systems are becoming more widely recognised as an alternative to sprinkler systems. National standards governing the testing, design, installation, and maintenance of water mist systems have been developed to regulate the industry. These include NFPA 750 (USA), CEN/TS 14972 (EU), NS-INSTA 900 (Norway), ISO 6182- 9 (international), and most recently, BS 8458 & BS 8489 for residential, domestic, industrial, and commercial water mist systems within the UK.

The origins of the development of water mist systems for marine and off-shore applications in the late 1980s were spurred by the Montreal Protocol, which phased out halon production amid concerns of CFCs’ detrimental effect on the ozone layer. Today, new environmental factors are driving demand for highly efficient water mist fire suppression systems.

An example of this is within the residential sector, where exists an ever-increasing need for housing, limited space to build; increasingly stringent energy efficiency targets; and an ever-present need to conserve water. Within urban environments, this is fuelling the rapid development of modern high rise buildings, the refurbishment of existing residential tower blocks, and in some cases, the redevelopment and change of use of office blocks into residential dwellings. While new-build high rise buildings are generally required to be equipped with an active fire suppression system, at present, most jurisdictions do not require sprinkler systems to be retroactively installed within older tower blocks constructed under superseded or outdated regulations. In the absence of active fire suppression, life safety and damage limitation rely upon the concept of “compartmentation” – the containment of a fire within a dwelling via the use of fire-resistant doors, partitions, and ceilings. Rigorous building control measures are necessary throughout the building’s life to ensure that any subsequent modification to the building’s fabric does not compromise the building’s fire stopping. The fire at Lakanal House, London, in 2009 serves as a reminder of the fatal consequences of the breaching of passive fire-stopping and the subsequent threat to life in the event of failure of compartmentation. Comprehensive inspection and assessment of the fire stopping throughout a building is often an impossible task, mainly as passive fire protection elements are usually concealed behind architraves, rendering, and other permanent, non-removable cosmetic finishes. If building control is lacking during the construction and subsequent modification of the fabric of the building, defects within passive fire stopping can remain undetected for years. In contrast, sprinkler and water mist systems are engineered to detect particular faults automatically. These systems are designed to enable rapid fault diagnosis within a regular schedule of essential maintenance and inspection.

Historically, sprinkler systems may have been the only option for architects, consultants, and main contractors for particular projects. The relatively recent formal recognition, standardisation, and acceptance of water mist systems for land-based applications open new possibilities and offer both technical and commercial benefits compared with sprinkler systems. In summary: water mist systems provide the potential for smaller pump units, less pipework, smaller pipe diameters, fewer heads, smaller water tanks, less water consumption, and lower running costs than sprinkler systems.

As the environmental, technical, and social challenges of global fire safety evolve, ULTRA FOG® continues to build upon its 30 years of experience in the research, development, and manufacturing of highly reliable water mist fire suppression systems and remains at the forefront of this life-saving technology.



Ultra Fog Fire Suppression System

3 - dimensional area of coverage -
water mist penetrates areas easier
than traditional sprinkler system.
Droplets suspended in the air can fill
the entire volume of the room

80 - 90% less water used in
comparison to the traditional
sprinkler system

Nozzles can be tested without
breaking frangible glass bulb. Test
may be performed by any competent
person, as Ultra Fog Test Tool is easy
to use.

Water mist system installed on the
right height, cools the fire.

It is common to use water mist
system in switchboard rooms and
data centers.



Area of Coverage



Water Usage



Testing



Liquid pool
fires



Sensitive electrical
applications



Traditional Sprinkler System

Bigger drops are only covering
area below traditional sprinkler,
not penetrating other areas.

Traditional Sprinkler Systems use
more water than the Ultra Fog
Fire Extinguishing System.

You can't test the nozzles without
breaking the glass bulb. Testing
traditional nozzles consumes
more time and expense.

Bigger water drops used in
traditional sprinkler systems may
displace the pool and cause fire
spread.

Traditional sprinkler systems are
not being used with sensitive
electrical applications.

04. Conclusion

Traditional sprinkler and Ultra Fog water mist system are both proven fire suppression technologies. The method by which they suppress fire is slightly different. Sprinkler systems use large volumes of water to wet the surface of the fuel. Water mist uses smaller volumes of water to cool the hot, flammable gases released from the fuel.

Better efficiency and shorter time needed to extinguish helps to reduce the quantity of toxic gases produced by the fire. The small water amount used while putting out a fire contributes to minor damage. Compared to sprinkler systems, high-pressure water mist is a sustainable way of fire protection: it requires only minimal quantities of water and power, it is environmentally friendly, does not harm humans, doesn't contribute to global warming, is lightweight, and reliable. Additionally, it is possible to test the nozzles without causing any harm to the system, thanks to the dedicated test tool.

Since 1990, Ultra Fog has been committed to a continuous programme of product development and fire testing in response to the latest rules, regulations, and worldwide standards. Ultra Fog products are 3rd party tested and approved by internationally recognised test protocols.

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