

## Performance Based Fire Protection With Water Mist

the applications to industrial hazards, high rise buildings and other areas of interest

<b>PART 1</b>	<b>PART 2</b>	<b>PART 3</b>	<b>PART 4</b>	<b>PART 5</b>
				
Marioff Corporation	Why use HI-FOG® ?	Industrial	High Rise	Other Examples

**Luciano Nigro – Marioff Corporation**

  
A UTC Fire & Security Company

## PART 1 Introduction - Marioff Corporation



In case of fire, this is good

This is better

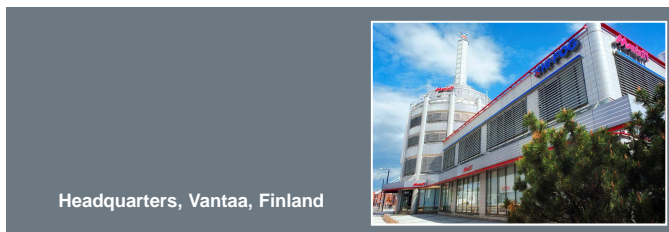
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## Marioff Corporation

- **Activity** Fire protection system manufacturer and supplier
- **Product** HI-FOG® Water Mist Fire Protection System
- **Mission** Protecting people, property & business continuity from fire
- **Core benefits**
  - Reduced fire, smoke and water damage
  - Minimal business interruption
  - Environmentally friendly



Headquarters, Vantaa, Finland

Marioff company presentation



## Marioff History in short

- **1985** Company was founded
- **1991** HI-FOG® was launched
- **Today**
  - World's leading water mist fire suppression company
  - HQ in Finland; offices in Germany, Italy, Spain, Sweden, UK and France. Extensive distributor & agent network
  - Part of United Technologies Corporation
  - More than 400 employees worldwide
  - Thousands of Marine and Land systems installed



HQ, Vantaa

Manufacturing, Kerava

Test facility,

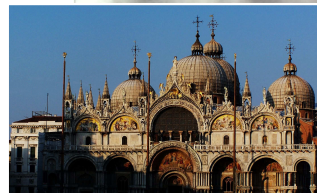
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## Marioff and HI-FOG® today

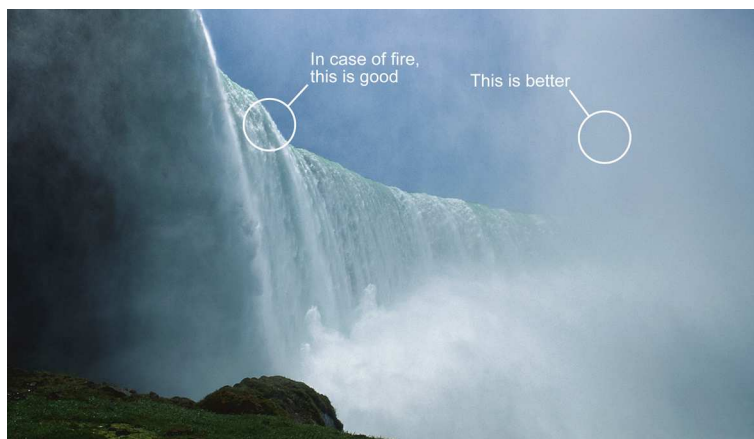
- Marioff protects yearly hundreds of hazards that include, very often, important buildings as well as valuable industrial equipment
- Development of new systems and new applications continue every day of the year
- HI-FOG® is a well known brand, sometimes used as a synonym to water mist fire protection



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## PART 2 Why use HI-FOG® ?



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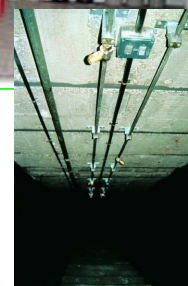




## Let's ask what are the reasons to install a HI-FOG® water mist fire protection system

- First of all: the reduced amount of water needed to control a given fire hazard, with respect to any other kind of technology – that means less water storage, but also less water damage!

**We talk about thousands of liters instead of hundred thousands**



- the size of the system and the size of the piping also play a role, specially in retrofit projects
- The high system pressure allows us to reach long distance as well as high heights

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## Let's ask what are the reasons to install a HI-FOG® water mist fire protection system

- When talking about industrial hazards water mist represents a valuable alternate solution to gaseous systems especially when room tightness is an issue for the efficacy of the protection!

**We talk of allowed openings going from significant leakages to open doors**



- the size of the system can be quite similar to the size of an ordinary gaseous system.
- The refilling of the system generally requires just a certain amount of plain water.

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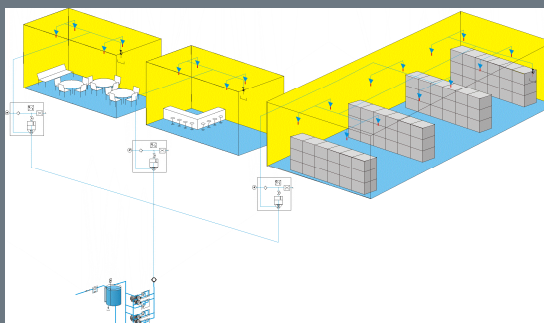


## Water Mist is a performance based fire protection

Water Mist technology follows a Performance-based approach  
All critical water mist system design and installation parameters are defined in full-scale fire tests:

- Nozzle type
- Operating pressure
- Flow rate
- Spacing
- Installation height

Therefore the applications  
Strongly depend on the fire  
Tests that have been  
Conducted



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## HI-FOG® have been tested

As mentioned before, HI-FOG® have been tested in a large variety of applications and therefore it can be used for a large variety of applications!



They Include:

- The complete series of marine applications, allowing Marioff to protect the large cruise ships.
- Commercial buildings including Hotels, High Rise buildings, Data Centres, Museums and Hospitals.
- Industrial applications
- Tunnel
- Trasportations .... And many others...



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## HI-FOG® fire testing

**Marine applications**


- Accommodation spaces, public spaces, service areas
- Balconies
- Special category and Ro-Ro spaces
- Deep fat fryers
- Galley and laundry ducts
- Machinery spaces: compartment protection
- Machinery spaces: local application
- Various navy applications



**Land applications: buildings and construction**

- Light & ordinary hazard 1 occupancies e.g. hotels, offices
- Ordinary hazard 2: parking garages
- Ordinary hazard 3 e.g. archives, shopping malls
- Ordinary hazard 4 e.g. theatres, cinemas
- Prisons
- Computer rooms
- Concealed spaces with cables / cable ducts

**Land applications: industry and energy**

- Gas turbines, machinery spaces and special hazard machinery spaces
- Outdoor transformers
- Industrial oil cookers
- Industrial cable tunnels
- Wet benches
- Fume hoods
- Anechoic rooms

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## HI-FOG® fire testing cont'd

**Land applications: tunnels and transportation infrastructure**

- Road and railway tunnels
- Climatic test tunnels
- Trains
- Metro escalators

**Miscellaneous**

- Window cooling
- Structural protection
- Smoke extraction
- Operational fire fighting

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**HI-FOG®**  
water mist fire protection

**IWMA**  
International Water Mist Association

## EXAMPLES among the others...



In case of fire,  
this is good

This is better

**HI-FOG® for Industrial Applications**  
**HI-FOG® for High Rise Buildings**

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water mist fire protection


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## Industrial Applications




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**HI-FOG®**  
water mist fire protection





**IWMA**  
International Water Mist Association

## Industrial HI-FOG® applications


<p><b>Power Generation &amp; Power Plants</b></p> <ul style="list-style-type: none"> <li>▪ Gas turbines</li> <li>▪ Diesel generators</li> <li>▪ Turbines</li> <li>▪ Conveyors</li> </ul> <p><b>Power &amp; Data Distribution</b></p> <ul style="list-style-type: none"> <li>▪ Transformers</li> <li>▪ Cable tunnels</li> <li>▪ Cable rooms</li> </ul> <p><b>Industrial Fryers</b></p> <ul style="list-style-type: none"> <li>▪ Oil Cookers</li> <li>▪ Ducts</li> <li>▪ Fines Boxes</li> </ul>	<p><b>Manufacturing &amp; Machinery Spaces</b></p> <ul style="list-style-type: none"> <li>▪ Painting Booths</li> <li>▪ Wind tunnels</li> <li>▪ Engine test cells</li> <li>▪ Production machinery</li> </ul> <p><b>Pulp &amp; Paper Industry</b></p> <ul style="list-style-type: none"> <li>▪ Paper machines</li> <li>▪ Conveyors</li> <li>▪ Pulp dryers</li> <li>▪ Coaters</li> <li>▪ Accessory machinery</li> </ul>
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water mist fire protection






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International Water Mist Association


## How to approach the challenge

When approaching a problem of fire protection with water mist technology, there are a few steps to comply with, in terms to achieve an effective protection system


- Classify the Hazard
- Check whether a fire test protocol exists for that hazard
- Check whether there are approvals issued by any recognized fire protection authority according to that protocol
  - **It is then possible to find at least an approved water mist system for the application**
- Consider the available systems.





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## Fire test protocols for Machinery Spaces

In the specific case of the Machinery Spaces there are several fire test protocols available.

- Factory Mutual classify the Machinery spaces dividing the Combustion Turbines from the other Machinery Spaces and Special Hazard machinery spaces. They issue the test protocols (FM 5560) and approve several systems, including Hi-Fog
- The German VdS also publish a fire test procedure for Machinery Spaces and issues approvals for water mist systems, including Hi-Fog.
- Other protocols are available from IMO for Machinery Spaces on board of ships.



VdS



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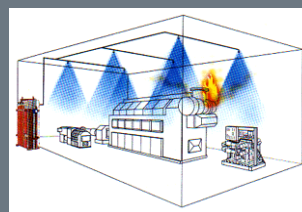
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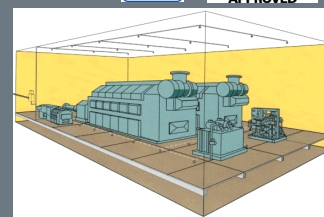
## Different types of water mist systems

The water mist systems that can be applied to the machinery space fire protection case are:

- Total Flooding water mist systems discharging water mist into the entire volume of the enclosure for a duration that is the key design parameter, together with the nozzle position and the water flow.
- Local application systems, where the water mist is applied to the specific area of hazard or to the specific machinery involved. In this case the extension of the system to cover all significant portions of the hazard also plays an important role together with the above mentioned parameters.

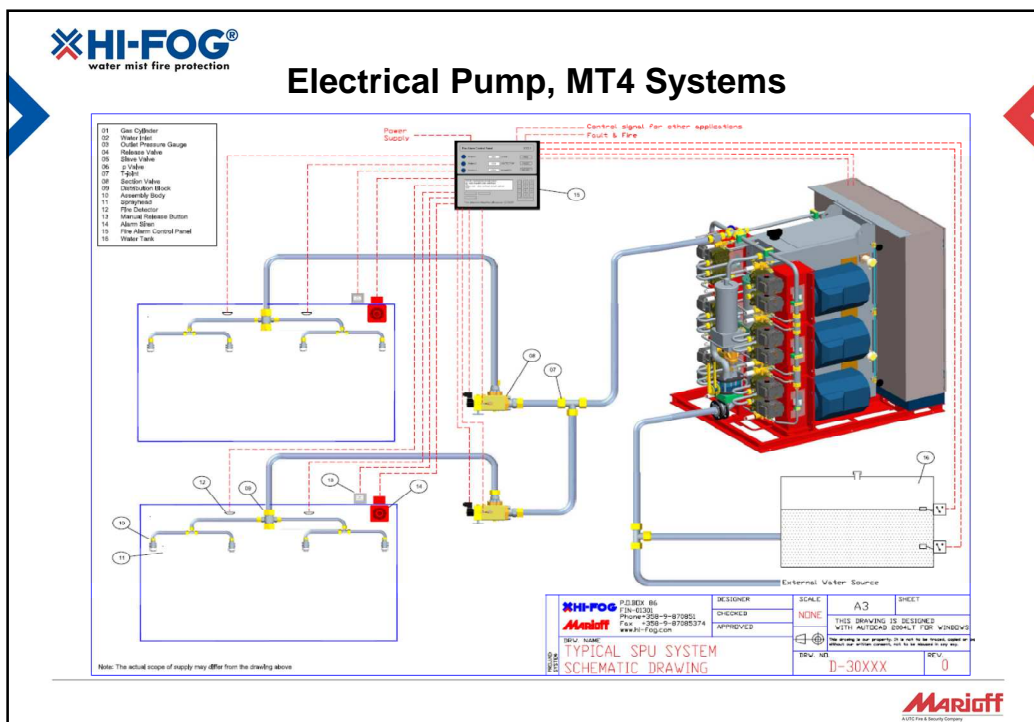
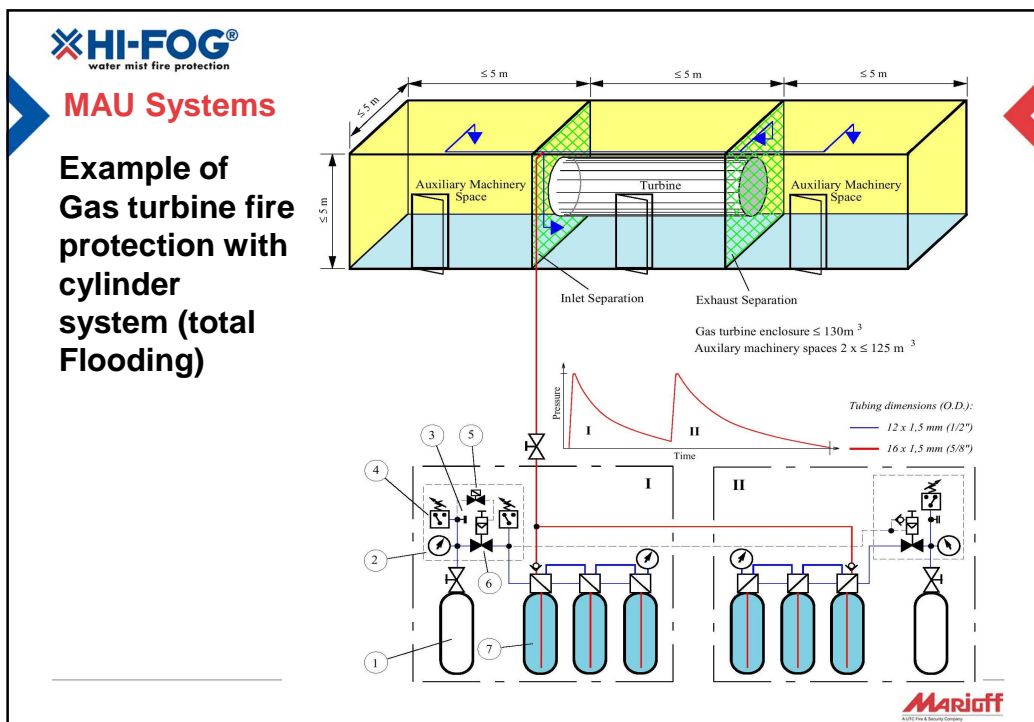


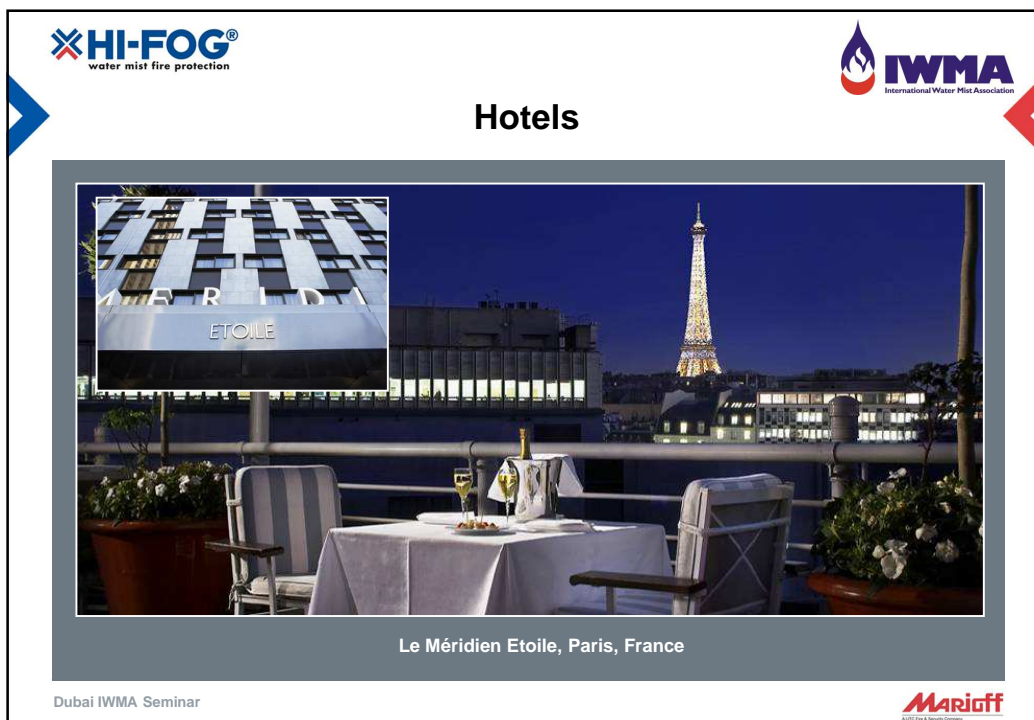
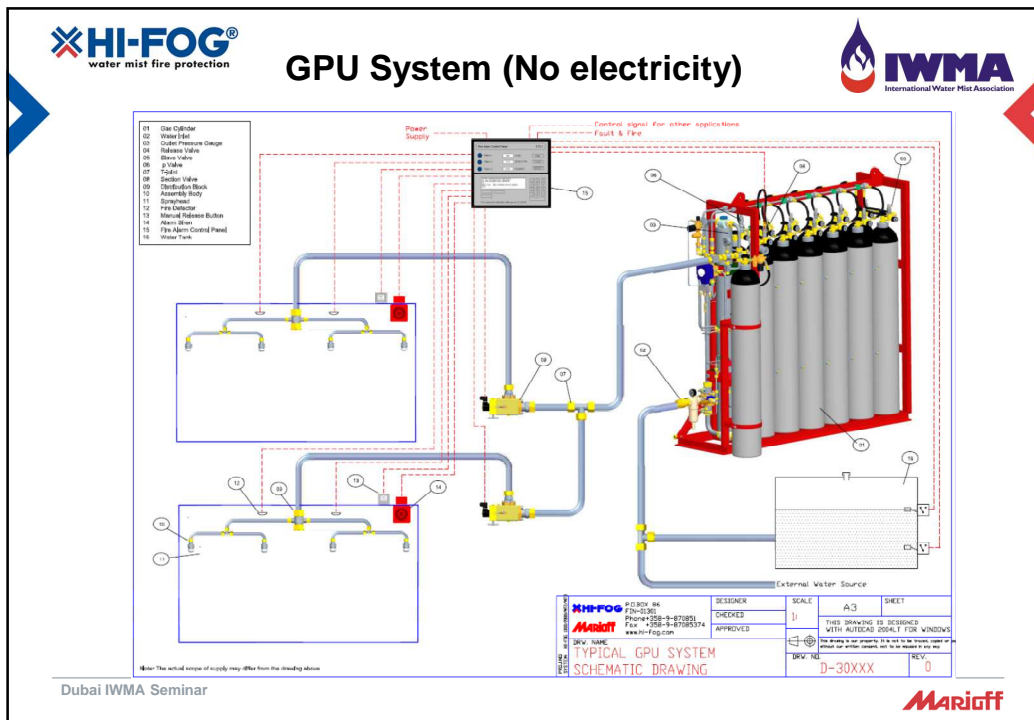
VdS



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## High-rise buildings

Hotel as well as Offices, or residences can be housed in a High rise building, that enhance the fire hazard...

- Cirrus, Helsinki, Finland's tallest residential building
- 28 stories
- 1,000 HI-FOG® sprinklers
  
- Less space needed for risers
- No booster pumps needed up to 300 m
- Less water damage compared to traditional sprinklers



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## How to approach the matter



The approach is the same as before

- Classify the Hazard: when talking of High Rise buildings the hazard is mainly related to the occupancy of the building
- Check whether a fire test protocol exists for that hazard.
- Check whether there are approvals issued by any recognized fire protection authority according to that protocol
  - **It is then possible to find at least an approved water mist system for the application**
- Consider the available systems and their suitability for the protection to be provided.



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## Fire test protocols for Commercial Buildings

When talking about buildings the most common case is to deal with building having multiple occupancies and related hazards. The available protocols include:

- Factory Mutual Light Hazard fire test protocol
- The German VdS offices and Hotel protocol including raised floors and false ceilings.
- The UL 2167 protocol for Ordinary Hazard occupancies that very often are included in the buildings.

**In any case we talk of closed nozzle “sprinkler like water mist systems”**

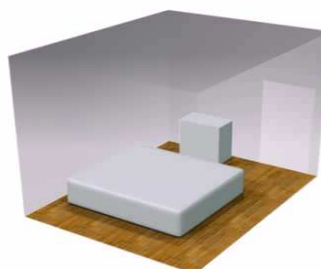


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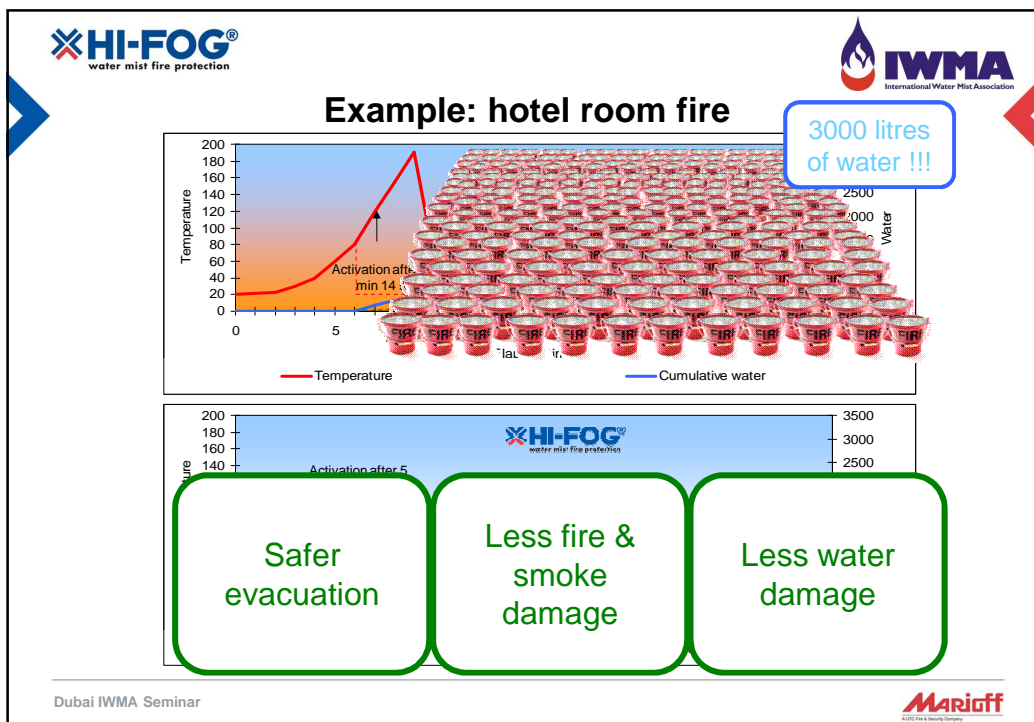
## High pressure water mist in action

**Hotel Room Fire**  
Water Mist Fire Protection System



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water mist fire protection

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International Water Mist Association

### The advantages are enhanced in High Rise Buildings

- **HI-FOG®** can protect high rise buildings with the advantages of high pressure that avoids the need for multiple pumping systems taking care each of a group of stories.
- **HI-FOG®** will use a limited amount of water, therefore minimizing the water discharge, that means minimizing also the need for water drainage facilities.
- **HI-FOG®** reduced size piping allows an easy installation, especially in retrofitting projects.

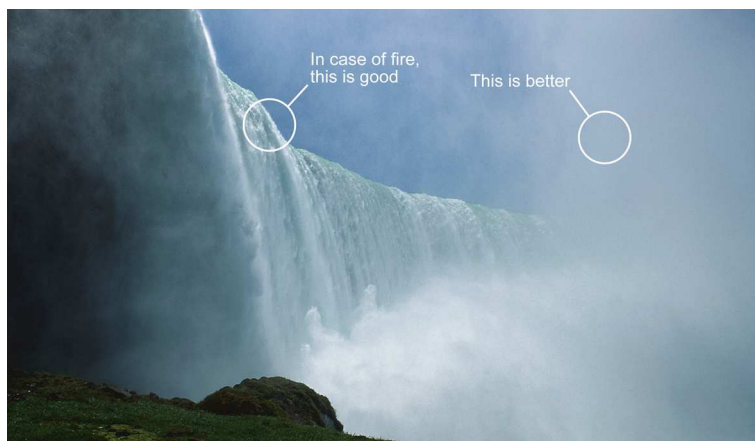


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## OTHER EXAMPLES



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## HI-FOG® marine references



Cruise Ships



Ferries & RoPax



RoRo & Car Carriers



Service Vessels



Cargo Vessels



Luxury Yachts



Navy



Offshore E&P

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## Large data centres



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## Key System Benefits

### Operational Reliability

- High quality components
- Strong R&D
- Minimized risk for leakages and false discharges

### Safety

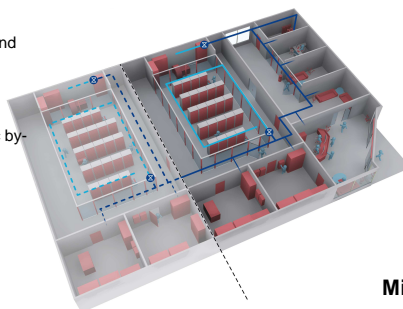
- No chemical additives & toxic by-products
- No risk of being banned
- Evacuation & fire fighting possible

### Green System

- HI-FOG® supports the environmentally sustainable design
- Low water consumption
- No demands on building fabric
- Etc.

### Total Facility Fire Protection

- All the spaces can be protected
- Simplicity of maintenance
- Total cost savings



### Scalability

- Support for modular concept
- Centralized pump unit
- Only sprinkler & tubing network expanded

### Flexible Installation

- Accommodates to other equipment
- Small tubing
- Compact pump units and water tanks
- No enclosure integrity requirements

### Minimized business disruption

- Very small amounts of clean water
- Localised discharge

### Turn-key deliveries

- Expert services throughout the system lifecycle







## HI-FOG® on land

Protecting transportation infrastructure



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## Transportation infrastructure

- Road and railway tunnels
- Metro stations
- Underground facilities
- Trains



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### Airport trains

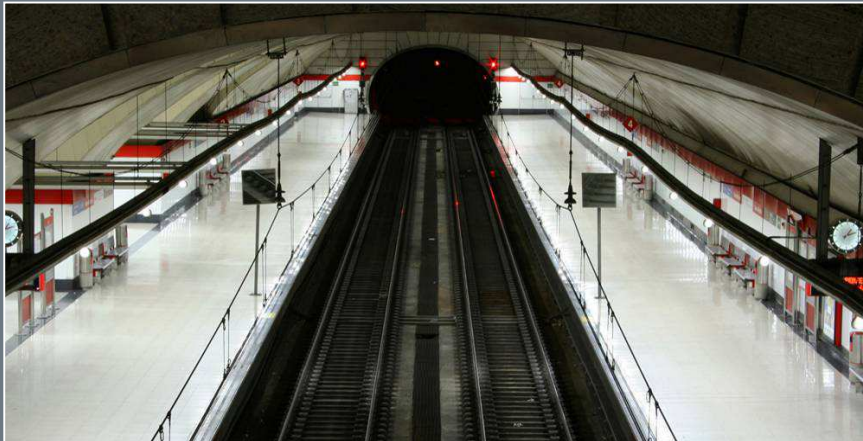


Washington Dulles Airport, USA

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### Metro stations



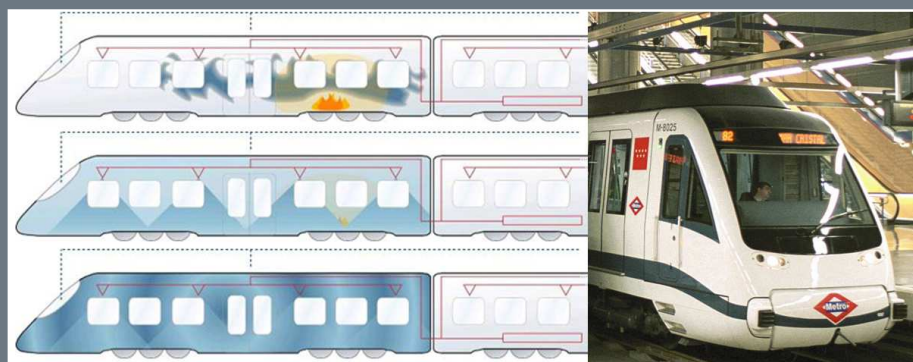
Madrid Metro, Spain

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## Trains

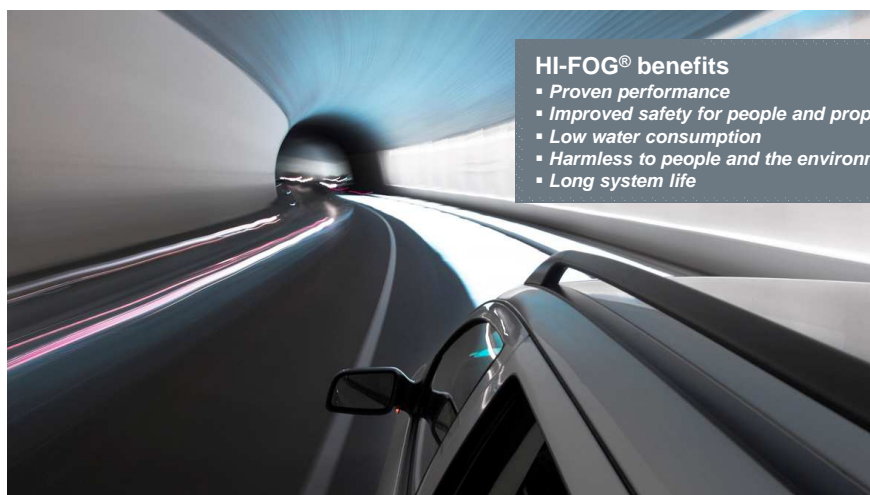


Over 1,500 Madrid Metro train carriages protected and counting

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## Road tunnels



### HI-FOG® benefits

- Proven performance
- Improved safety for people and property
- Low water consumption
- Harmless to people and the environment
- Long system life

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## Road tunnels



### Paris

- A86 West tunnel, part of “super-ring” road
- HI-FOG® protects 10 km section, two super-imposed levels
- Three pumping stations

### Madrid

- Tunnels of the M30 inner ring road
- HI-FOG® protects 5 important sections

### Abu Dhabi

- HI-FOG® protects Salam street Tunnel 4,2 km
- Middle East first automatic tunnel fire protection system

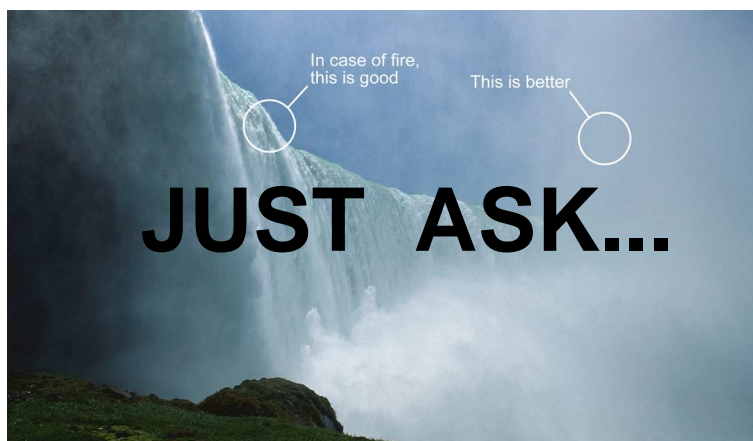
### Helsinki

- HI-FOG® protects City Service Tunnel
- Finland’s first automatic tunnel fire protection system

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## AND MANY OTHERS



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water mist fire protection

**THANK YOU**

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