VELMIST
System Mgły Wodnej Niskociśnieniowej
VID Fire-Kill Innovative Solutions

- FM Approved Low Pressure Watermist nozzles for commercial and industrial applications.
- Complete range of Low Pressure Watermist products for the maritime sector approved to the latest revisions of IMO standards.
- FM Approved Medium and High velocity water spray nozzles for heavy industrial and offshore applications.
- Unique Low Pressure Watermist infrastructure tunnel protection system tested and approved to handle fire scenarios up to 100MW in road, rail and other such infrastructure tunnels.
- Approved Control valves, pre-action valves, alarm check valves and Multiple Jet Control valves.
- ATEX zone 2 approved UV Flame detector with impulse counter.
- And much more...

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Quality & Approval Policy

**Production Approvals**
- ISO 9001:2008 Accredited by Bureau Veritas
- Factory Mutual QC Approved.
- DNV & GL MED-D Maritime production approved.

All products are made in traceable batch systems. All components are 100% tested before shipment. Samples from batches are fully component tested. VID Fire-Kill is audited 9 times per year to ensure continues high quality production.

**Product Approvals**
- FM Approval to FM5560 & FM2025
- DNV & LR MED and TA to IMO standards 1165, 265, 1387, 1430 & 15371.
- DNV to CEN/TS14972 appendix B.
- EN54-10 + ATEX Zone 2

All products are approval tested by internationally ISO17025 accredited test laboratories to internationally accepted approval standards.

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Values (compared to sprinklers)

- Use less water benefitting “green technology” (typical between 60%-80% saving),
- Aesthetic better looking (innovative designs),
- Covering certain applications better,
- Reduced systems weight,
- Can be more effective performance-wise toward hydrocarbon fires,
- Less water damages in case of (false) activation,
- Faster activation in case of fire – smaller damages,
- Less corrosion problems,
- Smaller pipe dimensions,
- Less business interruption due to smaller water damages.
Values (compared to high pressure WM)

- More robust systems (16 bar vs 300 bar),
- Larger waterways (orifices size for low pressure: 2.5mm, high pressure: 0.2mm),
- Less need for filtration and less risk of strainers clogging (y-strainers vs. paper filters),
- Use less power (reduces cost – easier to make 100% redundant systems),
- Cheaper system components (thin walled vs. thick walled, plastic pipes and galvanized pipes can in some circumstances be used in low pressure systems),
- Easier to install and maintain (standard connections such as PN16/25 press, thread, flange, groove vs. compression ring fittings)
2. The Physics of Fire Fighting with watermist systems & Watermist standards.
What is a Fire?

Air: 21% O₂ + 78,8% N₂ + ?
Fuels: Carbon + Hydrogen + ?

Energy to Fuel (heat)

Pyrolysis process
Fuel => Pyrolysis gasse
Example: CH₄

Energy to Pyrolysis gas + Atmosphere =>
Oxidation process

Fire example:
CH₄ + 2O₂ => 2H₂O + CO₂ + E
1kg O₂ => 13.000.000 joule

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Fire spread

1. Pyrolysis gasses are created.

2. Oxidation process happens.

3. Energy is released (seen as flames).

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As more heat will create more pyrolysis gasses, a fire will grow exponential until there is no more O2 or fuel.

This creates the big risk of fast fire spread (flashover).
What is watermist?

Watermist consist of small water droplets. Water is:

- Water = Liquid H₂O
- 1 mole Water Vo=18 ml
- Steam = Gas H₂O
- 1 mole steam V₀ =0.0224m³
  (0°C, 1 bar) = 22.4l steam

H(1)  O (16)  Mole

H (1)  18g

Phase change
1mole Water + 47000 Joule
=> 1mole Steam

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Europe
By definition, water mist is a water spray for which the 90%* of the total volume of liquid (Dv0.90) is in droplets of diameter smaller than 1000 microns at the minimum design operating pressure of the water mist nozzle.

* 99% according to NFPA

Watermist can perhaps also be seen as a way to develop new optimized products without having to follow existing product approval standards. E.g. minimum requirements for sprinkler orifices and water density inhibits sprinkler to use less water.

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The small droplets are created with specially designed nozzles at a certain water pressure. Nozzles exist in many forms:

- Automatic Nozzle
- Open Nozzle
- Special Nozzle

However the Water pressure and droplets size alone does not determine the performance of a watermist system, only fire – and component tests does.
How does watermist fight fires?

Focus on pyrolysis process

Blow away pyrolysis gasses => blow fire out

Cooling fuel => reducing the pyrolysis gas production

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How does watermist fight fires?

Focus on oxidation process

Cooling oxidation process => slow down process

Reduce oxygen concentration => reduce heat output

Inert gases from fires

Oxidation processes connect atm. oxygen to hydrogen and carbon from fuel, nitrogen remains in atmosphere => CO₂, H₂O (combustion) + N₂

+ Water Steam (inert gas)

= Inert gases reduces O₂ % in the vicinity of oxidation processes.

=> making it harder for the oxidation process to run

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Examples

High pressure:
- Buildings fires: Blowing + Cooling
- Industrial fires: Cooling + Suffocation

Low pressure:
- Buildings fires: Cooling + Wetting
- Industrial fires: Cooling + Suffocation

Sprinklers:
- Buildings fires: Wetting
- Industrial fires: Wetting + Cooling

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General Watermist use

As watermist primarily fight fires by cooling chemical processes and inerting the ambient of the oxidation processes.

**Water mist is most effective in locations with:**
- Large fires => large steam production
- High heat => Large steam production & little steam condensation
- Enclosures => Reduced oxygen supply => fast oxygen depletion
- Little ventilation => increased oxygen depletion effect.

So the safe thing to say is that watermist fits perfect into applications where one wants to reduce water and where:
- Large fires are expected to occur in enclosures.
- The main fire risk consist of small or medium fire loads.
- Ventilation rates are non-existing or small.

For this reason watermist fits perfect into applications such as:
- Industrial applications: Machine rooms, generator rooms, turbines, etc.
- Commercial applications: Schools, hotels, offices, accommodation areas, etc.
And for the same reason most available WM standards also cover these applications

**MARINE STANDARDS**

- IMO1165 (Total flooding machine room protection)
- IMO 1387 (local protection machine room protection)
- IMO 1430 (RORO)
- IMO MSC 265 (Accommodation areas)
- ISO 15371 (Fat fryers)
- Etc.

**LAND STANDARDS**

- FM5560: US light Hazard (EU OH1), machinery, turbines, special object protection, sub floor in data centre
- CEN/TS 14972: Offices, special Object protection
- UL2167: NFPA Residential areas, LH, OH1
- VDS : Car parks, cable tunnels, Hotels, Offices, false ceilings.
- UK: LPS1283 Domestic & residential areas, LH & OH1
- INSTA 900: Domestic & residential areas
- CNPP: Turbine tests
- Etc.

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3. Watermist standards
Overview of different standard types.

STANDARDS can be divided into three groups:

**Fire test standards (protocols):**
- Being used to find limitations for installation (e.g. installation height, vent., obstructions)
- Being used to find system specifics (e.g. K-factor, pressure, spacing)

**Component test standards (protocols):**
- Being used to determine if design and construction will be able to withstand 30 years lifetime.
- Being used to verify production quality and uniformity.

**Overall Design, Installation and Maintenance standards (codes)**
- Being used to specify common and overall requirements for all type watermist systems.
- Being used to describe risk classification, system operation area*, system duration time*.

* Sometimes these parameters are found from the testing standards.

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(Notifying Body, FM, VDS)
Example of available standards

Test standards examples:
- FM5560: US light Hazard (EU OH1), machinery, turbines, special hazards, more
- UL2167: US LH, OH1, OH2.
- VDS3188: Car parks, cable tunnels, OH1, Offices, more
- DD8485+8489: Domestic & residential areas, EU LH & OH1
- INSTA 900: Domestic & residential areas
- CEN/TS14972: Offices, Fat fryers, special hazards
- CNPP: Turbine
- IMO: All applications found on ships.

Design standard examples:
- USA, Middle East, Far East: NFPA 750
- Europe: CEN/TS14972
- Denmark: RETN. 254-1/2
- Scandinavia: INSTA 900: Domestic & residential areas
- Marine: SOLAS
- FM/VDS insured buildings: FM5560 / VDS 3188

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An overview starting from the design standards (part 1A)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NFPA 20</td>
<td>Low: EN12845 &amp; EN12259-12 (centrifugal) High: EN 14847 (positive displacement pumps).</td>
</tr>
</tbody>
</table>

| Components (tanks, Valves, hangers, pipes, nozzles, strainers, pump controllers) | Listed + minor requirements mentioned in NFPA 750 + Reference to ASTM standards (see part 3 for nozzles). | Reference to CEN/TS 14972 part 2-? + minor requirements mentioned in CEN/TS14972 part 1.+ Reference to EN standards for sprinkler and gas components. (see part 3 for nozzles). |

| Component Materials | Copper, Stainless steel or other listed materials with same corrosion resistance | Stainless steel or equivalent (copper, zinc coated steel (galv) and synthetic materials may be used if found not to create clogging). |

| Fire test accepted | See part 2 |

| Design (Classification, water supply) | Occupancy (minimum 30min). Specific (accordingly to listing, always ext. time x2). Design area accordingly to listing. | Application Specific. Water supply for pumped systems to be calculated as EN 12845 or listed, whatever is greater. Pre-eng.: 10min or ext. time x2, whatever is greater. |

| Other design and Installation requirement. | DIOM | DIOM |

| Maintenance requirement | NFPA 25 & DIOM | EN 12845 / EN15004-1 where relevant + DIOM |

| Final Acceptance | AHJ | AHJ |
### Notifying Body Design standards (part 1B)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Components (pumps)</strong></td>
<td>NFPA 20</td>
<td>FM approved.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM loss prevention datasheets, NFPA 20 and NFPA 750</td>
</tr>
<tr>
<td><strong>Components (tanks, Valves, hangers, pipes, nozzles, strainers, pump controllers)</strong></td>
<td>Listed + minor requirements mentioned in NFPA 750 + Reference to ASTM standards (see part 3 for nozzles).</td>
<td>FM Approved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FM loss prevention datasheets, NFPA 20 and NFPA 750 (see part 3 for nozzles).</td>
</tr>
<tr>
<td><strong>Component Materials</strong></td>
<td>Copper, Stainless steel or other listed materials with same corrosion resistance</td>
<td>Copper or Stainless steel only.</td>
</tr>
<tr>
<td><strong>Fire test accepted</strong></td>
<td>See part 2</td>
<td></td>
</tr>
<tr>
<td><strong>Design (Classification, water supply)</strong></td>
<td>Occupancy (minimum 30min). Specific (accordingly to listing, always ext. time x2). Design area accordingly to listing.</td>
<td>Occupancy: (FM DataSheet 3-26) Pre-eng.: 10min or ext. time x2, whatever is greater.</td>
</tr>
<tr>
<td><strong>Other design and Installation requirement</strong></td>
<td>DIOM</td>
<td>DIOM</td>
</tr>
<tr>
<td><strong>Maintenance requirement</strong></td>
<td>NFPA 25 &amp; DIOM</td>
<td>FM Inspection+ DIOM</td>
</tr>
<tr>
<td><strong>Final Acceptance</strong></td>
<td>AHJ</td>
<td>FM Inspection (APPROVAL)</td>
</tr>
</tbody>
</table>
## Accepted test protocols (part 2)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire test protocols where a listing can be obtained. The protocol shall be fit to the application and be accepted by the AHJ.</td>
<td>Fire test protocols are included in CEN/TS 14972 and written in part X-Y. Most protocols are copies from known, used and accepted protocols such as:</td>
<td>Fire test protocols are included in FM5560</td>
</tr>
</tbody>
</table>

- **Recognized in NFPA750:**
  - IMO 668 (1165) and IMO A800 (MSC 265)
  - FM5560, UL2167, CEN/TS 14972, (VDS?)

- **Existing!**:
  - Flammable liquids, cable tunnels, office, certain storage areas (all are copies of VDS protocols with minor changes), commercial deep fat fryer (copy of ISO15371).

- **FM (new):**
  - Machinery spaces, turbine enclosure, HC1 (application specific), Wet benches, industrial oil cookers.

- **VDS(new):**
  - Car parks, false floor/ceiling, hotel

- **LPCB(new):**
  - Residential & domestic, low hazard (application specific).

- **DFL(new):**
  - Atrium

---

**Test protocol designs examples will be presented under the product presentations.**
Component tests methods (Part 3)

Covers:
- Corrosion (materials)
- Nozzle design (strength)
- Glassbulb QC
- Fast release (RTI)
- Discharge patterns (even distribution)
- K-factor (Flow and pressure)
- Verification of fire test nozzles.
- Protection caps (packaging test)

Note: no droplet size tests (not needed).
If no standard is available for the application

CEN/TS 14972:2011, Annex B.

In accordance with this guideline it is possible to:

• Develop a test method for a specific application to any system type.
• Authorities involved in the project, accepts the protocol
• Conduct the fire tests described in the developed standard.
• Get the test results evaluated and documented in a test report.
• An ISO17025 accredited fire test laboratory shall conduct the fire test.
• Often the AHJ is involved throughout the entire test project.

Note: Further requirements are set to component tests and production QC level in the main CEN/TS14972 document.
How to follow CEN/TS14972 appendix B

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Examples of fuels that could be used.

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Evaluation of the compartment conditions.
Evaluation of pass/fail.

Control, suppression or comparison?

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The results

Test Method

Test report

AHJ witness letter

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Summery standards

NFPA 750 (2015)

CEN/TS 14972:2014
The New TS14972: Main Part
- Design
- Installation
- Maintenance

FM5560:2012
(Notifying body)

CEN/TS 14972
- Component test protocols
- Fire Test Protocols

Appendix B
(Other applications)

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4. Introduction to protection of commercial applications
What is a commercial application?

It is the inside of buildings where main risk is class A fires.

- Very little class B fires.
- No frost.
- No harsh ventilation.
- Not very high ceiling heights.

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Because of those factors, Automatic systems are the most simple, reliable and cheap to use.

What is Automatic?

Detector
Valve
Automatic systems.

Main components:
- Nozzles
- Filters
- Valves
- Flow indicators
- Pipe & fittings
- Pumps
- "Tanks"

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Time delay vs RTI vs. temp

FM small compartment
130dC

FM large compartment
150dC

FM Open Public Space
125dC

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Typical applications on land.

- Apartments
- Atriums
- Churches
- Concealed spaces
- Gymnasiums
- Hospitals and hospital laboratories
- Hotel rooms
- Institutions
- Kitchens
- Libraries
- Meeting rooms in convention centers and hotels
- Museums
- Nursing or convalescent homes
- Offices
- Restaurant seating areas
- Schools and universities classrooms
And other such areas...

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Standards for automatic nozzles

Best known examples:
- FM5560 (NFPA Light hazard)
- VDS (NFPA Light hazard)
- LPCB LPS1283 (NFPA Light hazard)
- UL2167 (NFPA LH, OH1, OH2)

However depends on what the local authority accepts..
How to work with automatic systems?

- NFPA750
- Local rules or guidelines

Also sometimes the sprinkler guidelines..

- NFPA 13
- EN 12845

Depends on what the local authority accepts..

+ DIOM Manual

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The design shall comply with the parameters used in successful fire tests for the specific hazard as defined in this document. These parameters shall include the following, as appropriate, e.g.:

- Nozzle type and unique identification.
- Additives, if any.
- Design pressure (pumped systems) / pressure versus time curve (self contained systems).
- Minimum nozzle flow rate/K-factor.
- Ventilation requirements.
- Materials
- Obstructions
- etc

Minimum and maximum values for the followings:
- ceiling height
- volume;
- nozzle spacing
- Other important and system specific data.
Tests define the DIOM

Example: FM5560 “HC1”

Limitations:
- Pendent nozzle: \(-H < 5\text{m}\)
- Sidewall nozzle: \(-H < 2.4\text{m}, \text{Area per room} < \text{the tested.}\)
- All nozzles: Flat smooth ceilings (<8.3%)

Note. All tests is carried out with the same nozzle version.
Component tests define:
- Materials.
- Filtration requirements.
- Pressure range
- Etc

Example: Component tests

1) Operating temperatures
2) Water flow
3) Water distribution
4) Water droplet size
5) Functional tests
6) Strength of nozzle body
7) Strength of release element
8) Leak resistance
9) Heat exposure
10) Thermal shock
11) Stress Corrosion
12) Salt spray corrosion
13) Moist air exposure
14) Water hammer
15) Dynamic heating (RTI, C)
16) Resistance to heat
17) Resistance to
18) Impact Test
19) Lateral discharge test
20) Thirty-day leakage test
21) Vacuum test

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The VID Fire-Kill Model OH-VSO

General Stats
- Minimum water pressure: 8 bar
- Maximum working pressure: 16 bar
- K-factor (metric): 16.7 (l/s/bar)
- FM approved nominal release temperature: 57°C
- Other nominal release temperatures: 68°C, 79°C, 93°C
- Time Response Index (metric): RTI < 50
- Fast Response Class
- Drop size: DV90 < 300 μm

Application
- Spacing (max): 20.25 m² (4.5m x 4.5m)
- Distance to wall (max): 2.25 m
- Height (max): 5 m
- Room size (max): Unlimited m²

Specific Stats
- Dimension: See fig. above
- Weight: 0.211 kg
- Housing: Brass
- Coating: NiSn
- Strainer: Stainless Steel
- Thread: ¼” BSP/BSP-T/NPT
- Standard Finish: Chrome
- Other Finish: Other RAL colors

Hydraulic System
- Water density: 2.3 mm²
- Minimum system operation time: 30min (60min if laboratory approvals are required)
- Minimum design area: 72m² (139m² if laboratory approvals are required)

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Can be installed flush, above and under ceilings

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### Example Office building

<table>
<thead>
<tr>
<th>System design parameters</th>
<th>Watermist</th>
<th>Sprinkler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design rules:</td>
<td>NFPA750</td>
<td>NFPA 13</td>
</tr>
<tr>
<td>Water supply run time:</td>
<td>60min</td>
<td>60 min</td>
</tr>
<tr>
<td>Design area:</td>
<td>140m²</td>
<td>140m²</td>
</tr>
<tr>
<td>Water density:</td>
<td>2.3 l/min/m²</td>
<td>5 l/min/m²</td>
</tr>
</tbody>
</table>

#### Tank size examples (room: 50m², 8m height)

- **Watermist:** 60min x 2.3 l/min/m² x 140m² = 19320 liter
- **Waterspray:** 60min x 5 l/min/m² x 140m² = 42000 liter

=> 54% tank size saving!

---

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Aloft Eccel London (Hotel)
Main Value:
Less water damage in case of fire => Less business interruption.

Chr. 4. Bryghus (museum)
Main value:
Smaller pipes, less damage to old building + water damage on artifacts

Queens University Belfast
Main value:
Cheapest system installed because of less water = smaller water tank!

Apple Store Edinburgh (Store)
Main value:
Nice design - concealed
5. Introduction to protection of industrial applications in enclosures
Typical industrial applications

Internal Combustion Engines
  Oil pumps
  Fuel filters
  Generators
  Transformer vaults
  Gear boxes
  Drive shafts
  Lubricated skids
  Diesel engine driven generators
  Combustion turbines

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Deluge systems

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Standards for deluge systems

Best known examples:
- FM5560 – Machinery and turbine enclosures.
- VDS - Machinery spaces.
- IMO 1165 – Total flooding in maritime machinerooms

However depends on what the local authority accepts..
How to work with deluge systems

- NFPA750
- Local rules or guidelines

*Depends on what the local authority accepts.*

*Engineered system:*
Flow and time found in fire test!
*Will be presented on next slides.*
**VID Fire-Kill Deluge systems**

**Certificate of Compliance**

**Innovative Fire Protection Solutions**

<table>
<thead>
<tr>
<th>Overall Technical Data</th>
<th>Machinery Spaces</th>
<th>Special Hazards &amp; Turbines (see full list on page 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum water pressure</td>
<td>7.7 bar</td>
<td></td>
</tr>
<tr>
<td>Maximum working pressure</td>
<td>16 bar</td>
<td></td>
</tr>
<tr>
<td>Drop size</td>
<td>DV$_{50}$ &lt; 300 µm</td>
<td></td>
</tr>
</tbody>
</table>

| General System Stats                                       |                  |                                                     |
| Minimum water pressure                                     | 7.7 bar          |                                                     |
| Maximum working pressure                                   | 16 bar           |                                                     |
| Drop size                                                  | DV$_{50}$ < 300 µm|                                                     |

**Design data**

<table>
<thead>
<tr>
<th>For enclosure size</th>
<th>medium</th>
<th>large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (max)</td>
<td>800m$^3$</td>
<td>4610m$^3$</td>
</tr>
<tr>
<td>Nozzle Spacing (max)</td>
<td>12.5 m $^2$</td>
<td>9 m $^2$</td>
</tr>
<tr>
<td>Distance to wall (max)</td>
<td>1.5 m</td>
<td>1.66 m</td>
</tr>
<tr>
<td>Height (max)</td>
<td>8 cm</td>
<td>12 m</td>
</tr>
<tr>
<td>Water density</td>
<td>1.4 mm/min</td>
<td>1.7 mm/min</td>
</tr>
<tr>
<td>Design run time</td>
<td>28:30 min</td>
<td>83 min</td>
</tr>
</tbody>
</table>
How are Deluge systems tested?

The enclosure size maximum define the system configuration

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Design comes from testing

<table>
<thead>
<tr>
<th>Test description</th>
<th>Extinguishing time 800m³, ceiling height 8m</th>
<th>Extinguishing time 4610m³, ceiling height 12m</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.4.1 Low Pressure, Exposed, Diesel Spray Fire</td>
<td>50sec</td>
<td>7min 12sec</td>
</tr>
<tr>
<td>E.4.2 Low pressure, Angled, Diesel Spray Fire</td>
<td>1min 42sec</td>
<td>6min 40sec</td>
</tr>
<tr>
<td>E.4.3 Low Pressure, Concealed, Diesel Spray Fire</td>
<td>2min 25sec</td>
<td>10min 38sec</td>
</tr>
<tr>
<td>E.4.4 High pressure, Exposed, Diesel Spray</td>
<td>2min 40sec</td>
<td>13min 22sec</td>
</tr>
<tr>
<td>E.4.5 Low Pressure-Low Flow, Concealed, Diesel Spray and Pool Fires</td>
<td>12min 55sec</td>
<td>41min 22sec</td>
</tr>
<tr>
<td>E.4.6 Concealed, Heptane Pool Fire</td>
<td>14min 15sec</td>
<td>18min 14sec</td>
</tr>
<tr>
<td>E.4.7 Flowing Fire</td>
<td>5min 17sec</td>
<td>10min 15sec</td>
</tr>
</tbody>
</table>

The longest time set the system run time

Innovative Fire Protection Solutions
<table>
<thead>
<tr>
<th>System design parameters</th>
<th>Watermist</th>
<th>Waterspray</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design rules:</td>
<td>NFPA750</td>
<td>NFPA 15</td>
</tr>
<tr>
<td>Water supply run time:</td>
<td>28:30min</td>
<td>60 min</td>
</tr>
<tr>
<td>Water density:</td>
<td>1.4 l/min/m²</td>
<td>10.2 l/min/m²</td>
</tr>
<tr>
<td>Nozzle spacing:</td>
<td>3.3m x 3.3m</td>
<td>3m x 3m</td>
</tr>
</tbody>
</table>

**Tank size examples (room: 50m², 8m height)**

Watermist: 28:30min x 1.427 l/min/m² x 50m² = 2033 liter

Waterspray: 60min x 10.2l/min/m² x 50m² = 30600 liter

=> 93% tank size saving!
Summery / key notes
- Watermist is a good technology for many applications, but not all.
- Watermist is a standardized technology, but one needs more knowledge to work with.
- Watermist can with the appropriate approvals be used in both commercial and industrial applications.
Thank you for your attention
<table>
<thead>
<tr>
<th>Dział administracji</th>
<th>Dział handlowy</th>
<th>Dział serwisu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michał Zagalak</td>
<td>Bartosz Łebek</td>
<td>Kamila Krzyżowicz</td>
</tr>
<tr>
<td>tel. 881 920 215</td>
<td>tel. 728 341 931</td>
<td>tel. 608 574 325</td>
</tr>
<tr>
<td>Tomasz Klasło</td>
<td>Arkadiusz Słowik</td>
<td>Mariusz Masłosz</td>
</tr>
<tr>
<td>tel. 660 414 551</td>
<td>tel. 600 959 392</td>
<td>tel. 602 628 589</td>
</tr>
</tbody>
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