Ultra Fog Presentation | IWMA Paris
October 16 2013

High pressure water fog sprinkler systems for fighting fires

www.ultrafog.com
Topics for this presentation

- Protection of high voltage transformers
- Protection of gas turbines and machinery spaces
- How to test an automatic sprinkler nozzle
Protection of high voltage transformers

How the use of water mist droplets can utilise a very good fire fighting performance on high voltage transformers.
Protection of high voltage transformers

*Water Mist: Droplet size below 1000 microns [NFPA 750]*

HP water mist droplet size typically 15 – 200 microns

Provides very low conductivity
Protection of high voltage transformers

NFPA 750 gives guidelines for clearance.

<table>
<thead>
<tr>
<th>Nominal System Voltage (kV)</th>
<th>Maximum System Voltage (kV)</th>
<th>Design BIL (kV)</th>
<th>Minimum Clearance *</th>
</tr>
</thead>
<tbody>
<tr>
<td>To 13.8</td>
<td>14.5</td>
<td>110</td>
<td>178 mm, 7 in.</td>
</tr>
<tr>
<td>23</td>
<td>24.3</td>
<td>150</td>
<td>254 mm, 10 in.</td>
</tr>
<tr>
<td>34.5</td>
<td>36.5</td>
<td>200</td>
<td>330 mm, 13 in.</td>
</tr>
<tr>
<td>46</td>
<td>48.5</td>
<td>250</td>
<td>432 mm, 17 in.</td>
</tr>
<tr>
<td>69</td>
<td>72.5</td>
<td>350</td>
<td>635 mm, 25 in.</td>
</tr>
<tr>
<td>115</td>
<td>121</td>
<td>550</td>
<td>1067 mm, 42 in.</td>
</tr>
<tr>
<td>138</td>
<td>145</td>
<td>650</td>
<td>1270 mm, 50 in.</td>
</tr>
<tr>
<td>161</td>
<td>169</td>
<td>750</td>
<td>1473 mm, 58 in.</td>
</tr>
<tr>
<td>230</td>
<td>242</td>
<td>900</td>
<td>1930 mm, 76 in.</td>
</tr>
<tr>
<td>345</td>
<td>362</td>
<td>1050</td>
<td>2134 mm, 84 in.</td>
</tr>
<tr>
<td>500</td>
<td>550</td>
<td>1500</td>
<td>3150 mm, 124 in.</td>
</tr>
<tr>
<td>765</td>
<td>800</td>
<td>2050</td>
<td>4242 mm, 167 in.</td>
</tr>
</tbody>
</table>

* For voltages up to 161 kV, the clearances are taken from NFPA 70, National Electrical Code. For voltages 230 kV and above, the clearances are taken from Table 124 of ANSI C2, National Electrical Safety Code.
Protection of high voltage transformers

Full scale fire testing

Semi closed Transformer

Transformer size: 10MW

Dimension: 4,4m³ (14,7M²)

Fire heat release: 10MW

Nozzles no: 8pcs, k-factor 0.8

Result:

Extinguishing: 45sec

Water used: 48L
Protection of high voltage transformers

Full scale fire testing

Open space Transformer

Transformer size: 30MW

Dimension: 26.1m³ (31.2m²)

Fire heat release: 40MW

Nozzles no: 16pcs, k-factor 1.76

Result:

Extinguishing: 65sec

Water used: 207L
Delivering fire protection solutions for industry, buildings, occupants and property
Protection of high voltage transformers

With use of the low conductivity and the high cooling effect from water mist, the system can be used to cool down transformer in operation.
Protection of gas turbines and machinery spaces

Application standard: FM 5560 - 2012

Machinery enclosures and Combustion Turbines enclosures

Annex C+D: Volumes up to 260m³

Annex E+F: Volumes up to 1200m³
Protection of gas turbines and machinery spaces

**Application standard:** FM 5560 – 2012

**Fire test scenario:** Appendix C & D (<260m³)

- **Spray fires:** diesel & heptan fuel, 1 and 2MW, shielded & unshielded
- **Pool fires:** diesel & heptan fires, 1m²

**Spray Cooling:** Cooling test from 300°C heated 2m², 5cm thick steel plate to verify even and controlled cooling.
Protection of gas turbines and machinery spaces

Application standard: FM 5560 – 2012

Fire test scenario: Appendix E & F (<1200m³)

Spray fires: diesel fuel, 1 to 6MW, shielded & unshielded

Flowing fire: heptan fuel, 28MW

Pool fires: diesel & heptan fires, 1m², 1 to 7,5MW

Spray Cooling: Cooling test from 300°C heated 2m², 5cm thick steel plate to verify even and controlled cooling.
Protection of gas turbines and machinery spaces

Fire test video, spray & pool fire test, 260m³
How to test an automatic sprinkler nozzle
How to test an automatic sprinkler nozzle

Why?
Commissioning  Service  Verifying

Commissioning: Drain pipe work from air to create more a robust system and for faster activation.

Service: To check function and water quality

Verifying: Check flow and k-factor
How to test an automatic sprinkler nozzle

Ultra Fog Test tool

Tool comes with a hose to collect water to a bucket/bottle for measuring of flow and k-factor
How to test an automatic sprinkler nozzle

Connect Ultra Fog test tool to sprinkler head.
Then push rod to open the sprinkler head.
After finished test, release rod and remove test tool.
How to test an automatic sprinkler nozzle
Thank you for your attention