Protection of large scale hospitals with High-Pressure Water Mist (HPWM)

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Summary

1. Introduction

2. Objectives

3. Choosing HPWM system
   - Traditional advantages
   - Additional advantages

4. Components and Installation
250,000 m² Somatic University Hospital (DNU) protected entirely with a SEM-SAFE® HPWM System
DNU Skejby Hospital – Fire Safety Strategy

The Fire Safety Strategy is based on:

- **Danish Building codes, performance based:**
  - Acceptance criteria for human safety
  - Acceptance criteria for fire safety in relation fire & smoke spread

- **Building requirements from building owner:**
  - “Create a:
    - Modern
    - Professional
    - Urban
    - User friendly environment”

**RESULT:**
**MAXIMUM FIRE SAFETY LEVEL**

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1. Introduction
Fire Protection of the entire hospital with SEM-SAFE®

1. OPERATING THEATRES
2. PATIENT ROOMS
3. STAFF FACILITIES ROOMS
4. OFFICES
5. SERVER ROOMS
6. GLASS CORRIDORS
7. CONSULTATION ROOMS
8. HIGH SENSITIVE EQUIPMENT ROOMS
9. KITCHENS AND DUCTS
10. CORRIDORS
11. CANTEENS
12. CAR PARKS
13. LAUNDRY ROOMS
14. ARCHIVES
15. PHARMACY
16. STORAGE AREAS
17. UNDERGROUND AMBULANCE AREAS
18. RECEPTION AREAS
19. EMERGENCY GENERATOR ROOMS
20. LOBBIES AND WAITING ROOMS

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2. Objectives
OH1 areas in an hospital protected with SEM-SAFE®

- Patient rooms
- Offices
- Staff facilities
- Corridors
- Operating theatres
- Kitchens and ducts
- Reception areas
- Lobbies and waiting areas
- High-sensitive equipment rooms
- Staff facilities rooms
- Canteen
- Server rooms
- Glass protection and atria
- Emergency generator rooms
- Technical rooms
- Archives
OH2 areas in an hospital protected with SEM-SAFE®

- Car parks
- In house ambulance parking
OH3 areas in a hospital protected with SEM-SAFE®

- Storage rooms
- Shopping areas
- Laundry rooms

Examples
OH3 shopping area
### Choosing HPWM system

<table>
<thead>
<tr>
<th>Category</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOW WATER DEMAND</strong></td>
<td>- Immediately cools the fire, preventing fire growth</td>
</tr>
<tr>
<td></td>
<td>- Minimal water damage</td>
</tr>
<tr>
<td><strong>SYSTEM FLEXIBILITY</strong></td>
<td>- Modular design, easy to extend to cover more sections</td>
</tr>
<tr>
<td><strong>MINIMAL INVASIVE TECHNOLOGY</strong></td>
<td>- Harmless to electrical installation(IP23)</td>
</tr>
<tr>
<td><strong>PROVEN TECHNOLOGIES &amp; APPROVALS</strong></td>
<td>- Flexibility in approvals</td>
</tr>
<tr>
<td><strong>PERFORMANCE BASED TECHNOLOGY</strong></td>
<td>- Not only a modern sprinkler system</td>
</tr>
</tbody>
</table>
Reduced water amount

SEM-SAFE® HPWM

LPWM

Sprinkler

SEM-SAFE® uses up to 50% less water compared to LPWM

SEM-SAFE® uses up to 80% less water compared to sprinkler

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3. Choosing a HPWM system
### Higher spacing

<table>
<thead>
<tr>
<th>HPWM</th>
<th>LPWM / Sprinkler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer nozzles &amp; pipes</td>
<td></td>
</tr>
<tr>
<td>Smaller stainless steel pipes &amp; fewer fittings</td>
<td></td>
</tr>
<tr>
<td>Easy to integrate</td>
<td></td>
</tr>
</tbody>
</table>

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3. Choosing a HPWM system
Lesser pipes & fittings

- Piping materials:
  - Stainless steel AISI 316
  - Maintenance free (no corrosion)

Typical pipe size

<table>
<thead>
<tr>
<th></th>
<th>HPWM</th>
<th>LPWM</th>
<th>Traditionel sprinkler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle Pipes</td>
<td>Ø10 - 15 mm</td>
<td>Ø25 - 40 mm</td>
<td>Ø25 - 50 mm</td>
</tr>
<tr>
<td>Ring pipes</td>
<td>Ø22 - 33.4 mm</td>
<td>Ø50 - 80 mm</td>
<td>Ø65 - 100 mm</td>
</tr>
<tr>
<td>Main pipes</td>
<td>Ø33.4 - 60.3 mm</td>
<td>Ø80-100 mm</td>
<td>Ø100 - 200 mm</td>
</tr>
</tbody>
</table>
Effective fire protection with SEM-SAFE®

- Higher cooling capability than sprinkler (up to 7 times better than traditional sprinkler)
- Optimal control of the fire
- Minor droplets size compared to traditional sprinkler and low-pressure water mist
- Fast evaporation of the water, while sufficient speed to penetrate the fire. Water damage is kept to a minimum
- Gentle with electrical equipment
- The functionality of the electrical equipment in the hospital is not disrupted and the data is saved
### Fire protection of large scale hospitals with High-Pressure Water Mist; Lasse Sørensen Laustsen

#### 3. Choosing a HPWM system

<table>
<thead>
<tr>
<th>HPWM Price</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quotation price</td>
<td></td>
</tr>
<tr>
<td>HPWM Price</td>
<td>Total investment with sprinklers</td>
</tr>
<tr>
<td>Indirect savings</td>
<td></td>
</tr>
<tr>
<td>Direct savings</td>
<td></td>
</tr>
</tbody>
</table>

#### Costs:
- Quotation price
- Cost for ground work, trench and pipes
- Cost of water supply
- Cost for storage tank space
- Additional design coordination cost
- Cost for pump room space
- Other extra costs for the initial investment
- Cost reduction for fire insulation of ventilation duct (lower temp.)
- Cost reduction for fewer fire damper in ventilation
- Cost reduction for securing risk of fire spread
- Water curtains for controlling heat and smoke
- Protection of steel structure
- Other cost reduction
- Other extra costs for the initial investment
Performance-based fire safety – Focus areas

Typical focus areas with performance-based fire safety

- Evacuation & rescue measures
- Fire brigade`s intervening
- Fire safety installations
- Fire & smoke spread
- Constructions

Cost reduction by use of SEMSAFE®
With a fire safety analysis, we can take advantages of SEM-SAFE® superior characteristics for “indirect savings”

**Radiation:** SEM-SAFE® is characterized by effective absorption of heat radiation

**Temperature:** SEM-SAFE® is characterized by effective cooling of combustion gases in enclosure

**Smoke:** SEM-SAFE® helps controlling smoke and reduction of soot & particles from a fire, by keeping the ventilation system running
Radiation – Horizontal & vertical fire spread between fire sections

- Protections against fire spread: Limiting temperature and radiation from fire results in less requirement for insulation/separation.

- Fire spread at external surfaces of a building can occur due to radiation, for example in a corner of a building through the glass facades.
Radiation – Horizontal fire spread between fire sections

- Radiation through a water mist barrier is depending on the droplet size, wavelengths (electromagnetic waves) and the amount of droplets the radiation interacts with “smaller droplets gives better absorption”

- Radiation can be
Temperature - Cooling of combustion gases in enclosure

- HPWM has superior capabilities to absorb heat from the fire, smaller droplet has the best effect on radiation.

- With HPWM, lower temperatures secure cost reduction in specification for insulation materials, and/or fire dampers within a ventilation system.

- With SEM-SAFE®, it is possible to continue use of a ventilation system for smoke extraction during a fire. Lower temp doesn't damaged ventilation engines.

- Reduced service cost of traditional solution for smoke and/or fire dampers in ventilation system.

- Protection of steel structures: Cooling of fire results in less requirement for fire insulation.
SEM-SAFE® adds value

- Savings for glass facades
- Savings for insulation of ventilation system
- Savings in numbers of fire & smoke dampers in ventilation system
- Savings for insulation of breach through fire sections, piping etc.
- Savings for insulation of steel structures
- Savings for reduced service cost at water curtain compared to high service cost at alternative solution with automatic fire doors
SEM-SAFE® adds value

- Added value by optimal control of a fire
- Added value by securing continued use of ventilation system for smoke extraction
- Added value as lower temperature secure options for reduced dimension of the steel structure
- Added value as smoke in general is reduced
Added value at DNU hospital, savings 11,33 mill Euros

- Water supply, actual savings 0,27 mill. Euros
- Glass in galleries, actual savings 2,8 mill. Euros
- Isolation & insulation of ventilation system, actual savings 4,15 mill. Euros
- Structural design, steel structure etc., actual savings 3,45 mill Euros
- Vertical fire spread, actual savings 0,16 mill Euros
- Water curtains instead of automatic fire doors, actual savings 0,14 mill Euros
  *Plus reduced service cost at water curtain*
### Quotation price

- Cost for ground work, trench and pipes
- Cost of water supply
- Additional design coordination cost
- Other extra costs for the initial investment
- Cost reduction for fire insulation of ventilation duct (lower temp.)
- Cost reduction for fewer fire damper in ventilation
- Cost reduction for securing risk of fire spread
- Water curtains for controlling heat and smoke
- Protection of steel structure
- Other cost reduction

### Direct savings

- HPWM Price
- Total investment with sprinklers

### Indirect savings

- Quotation price
- Savings
All key components for SEM-SAFE® high-pressure water mist are manufactured in-house

- 100% tested
- Less water consumption
- Fully optimized nozzle program for different applications
- High spacing

- World’s lightest and most compact high-pressure pump
- Multi-axial piston pump in stainless steel
- Uses water as lubricant

- Stainless steel valves
- Compact and modular block valves

Click above to open video
DNU Video

The New University Hospital (DNU) in Aarhus, Skejby
To be completed in 2019

Click above to open video
Thank you for your attention

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