The Mont Blanc tunnel project

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Fires in tunnel

- Car fire
  > 4 to 8 MW
- Van fire
  > 15 MW
- HGV fire
  > 30 MW
- Big HGV fire
  > 100 MW
- Big HGV fire with hazardous materials
  > Up to 200 MW
Smoke management strategy in tunnels

- Preserving smoke stratification = transversal ventilation

- Pushing the smoke = longitudinal ventilation
The Mont Blanc tunnel

- **Geometry**
  - > 11600 m length
  - > Slight slopes
  - > 8.6 m wide by 6.0 m high cross section
The Mont Blanc tunnel

- **Smoke management strategy**
  - Transversal ventilation (156 m³/s extraction)
  - Longitudinal control of air flow
- **A very safe control of smoke**
Critical questions about the use of water mist in Mont Blanc tunnel

• Can we use water mist in order to increase again the safety level in the tunnel?
  > What is the impact of such system on the safety strategy?

• What is the best way to use water mist system as an additional safety equipment in cooperation with smoke management?
  > How does water mist interact with smoke management system?
Fire development phases

- Untenable conditions for firemen
- Lethal conditions
- Degradation of tenability
- HRR used for the design of ventilation system

HRR

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>No stratification</td>
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<tr>
<td>Self rescue</td>
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<tr>
<td>Helped rescue</td>
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<tr>
<td>Death</td>
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No fire fighting

Fire fighting
Fire development phases: “small fire”

- HRR
- Untenable conditions for firemen
- Lethal conditions
- Degradation of tenability
- HRR used for the design of ventilation system

Why using water mist system in this case?

- Small fire
- Extinction
- Firemen intervention
- Self rescue
- Smoke management
- Fire detection
Fire development phases: “big fire”

- Untenable conditions for firemen
- Lethal conditions
- Degradation of tenability
- HRR used for the design of ventilation system

- Fire detection
- Smoke management
- Self rescue
- Helped rescue
- Destratification
- Water mist activation
- Firemen intervention

HRR

No activation

Activation recommended

Uncontrolled fire

Controlled fire
### Longitudinal ventilation

<table>
<thead>
<tr>
<th></th>
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<th>Thermal actions</th>
<th>Toxicity</th>
<th>Visibility</th>
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<tr>
<td>People</td>
<td>++</td>
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<td>+</td>
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## Interaction between water mist and fire conditions

### Transversal ventilation with smoke stratification

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- **Destratification?**
**Interaction between water mist and fire conditions**

- **Transversal ventilation without smoke stratification**

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Reducing HRR can help the smoke extraction system
Key issues

- **Should we activate water mist system?**
  - What is the fire scenario?
  - Is the fire likely to degenerate?

- **When should we activate the system?**
  - Are there still drivers in the tunnel?
  - Interaction between water mist and smoke stratification
  - Effect of water mist flooding on fire activity
    - Reducing HRR?
    - Increasing toxicity?

- **Where should we activate the system?**
  - Ability to locate the fire
  - Extent of flooding area?
Thank you for your attention