Water Mist and NECs - SUVEREN Research Project

Content of presentation

- Water mist & NEC keywords
- SUVEREN research project
  - Numbers
  - Motivation
  - Water mist
- Conclusions
Water Mist and NECs - Keywords

History of water mist

• Water mist got the boost in early 1990’s, but why?
  – Some **new fire risks** noticed
    • e.g. Cruiseliners
  – **Environmental** aspects
    • HALON
    • Water mist with pure water / no additives
History of new energy carriers

- Environmental aspects
- New fire risks are noticed.
SUVEREN:

„Safety of New Energy Carrier Vehicles in Urban Underground Transportation Infrastructure“

- Budget – 2 M€
- Timeframe – 2018-2020
- Innovative research problem focusing on fire safety of NECs.
- Will develop very unique and innovative knowledge that can be used for building/operating infrastructure with NECs.
- Creating knowledge that can be used in other applications and industries dealing with NECs
SUVEREN Contributors

• Partners:
  - BAM
  - FOGTEC
  - STUVA

• Associated Partners:
  - DB NETZE
  - CETU
  - INERIS

• Advisory board:
  International specialists, facility operators, universities, research institutes etc.

European Union

“Transport needs to develop along a more sustainable path. With the COP21 Paris Climate agreement, efforts to reduce greenhouse gas emissions are becoming even more urgent. An energy-efficient, de-carbonised transport sector is needed.”

“The European Commission is pushing the electrification of all modes of transport, including road, rail, air and sea.”

“Recent events regarding diesel technology clearly show the limits of current technologies to achieve our goals and show the need for a clear technological shift.”

Foreword to ZEEUS report 2017
Claire Depré
Head of Unit, “Sustainable and Intelligent Transport”
Directorate-General for Mobility and Transport
European Commission
## NEC categories (most common)

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Type of NEC Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEV</td>
<td>Battery Electric Vehicles</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed Natural Gas Vehicles</td>
</tr>
<tr>
<td>FCEV</td>
<td>Hydrogen Fuel Cell (Electric) Vehicles</td>
</tr>
<tr>
<td>LPG</td>
<td>Liquified Petroleum Gas Vehicles</td>
</tr>
<tr>
<td>PHEV</td>
<td>Plug in Hybrid Electric Vehicles</td>
</tr>
<tr>
<td>ICE</td>
<td>Internal Combustion Engine (Conventional gasoline or diesel engines)</td>
</tr>
</tbody>
</table>

## NEC prognosis

Major difference between countries

- **Norway**
  - 2018: More electric and hybrid vehicles sold than conventional gasoline and diesel vehicles
- **Germany**
  - Major focus to NECs, especially to electric
- **Finland**
  - Both gas vehicles (CNG) and electric
- Difficult to predict trends and future
Passenger cars or other vehicles

- Passenger cars
  - Many different technologies (emerging or stable)
  - Many fires that have reached media attraction

- Busses
  - Have already utilised new energies to a large extent
  - Electric, gasous, LPG, hydrogen, etc., all technologies are developing.

- Trucks
  - Still developing, first prototypes of electric vehicles shown.
  - LPG, CNG etc. related to combustion engines is already been in use.

NEC and fires – Media attraction
NEC and fires?

- Not really known in detail or is it true?

- What is known:
  - New risks?
  - More difficult to extinguish?
  - Toxic gases?
  - Different energy releases?

SUVEREN – „Underground“

- Fires in a closed compartment will emphasise the importance of fire safety

- All special risks of NEC will be emphasised in underground

- Many famous fires, e.g. Liverpool 2018 with 1400 cars
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• Main application areas:
  – Car parks (closed/underground)
  – Bus terminals
  – Road tunnel
  – Underground loading zones
• Further knowledge for other applications

SUVEREN – „Underground“

• How to save infrastructure?
• How to save people?
• How to secure safety of fire services?

• Solution is holistic
  – Fire risks: reignition of batteries, vapour clouds etc.
  – Design: fire compartments, ventilation
  – Technology: FFFS (water mist), detection etc.
  – Implementing
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• Working tools:
  – Analyses, prior data, car industry
  – CFD and development of new design tools
  – Fire testing
  – Reporting and guidance
  – Networking for distributing developed guidance
Further knowledge

- Knowledge with battery fires
  - Fire tests with real car batteries
  - Data can be used for other important applications and whole life cycle
    - Production / storage
    - Development areas
    - Transportation
    - Disposal
- Hydrogen fires
  - Co-operation with other research projects

Water mist

- Water mist selected as tested extinguishing / controlling technology
  - Electric vehicles & battery packs

- Things to be considered
  - Electricity in combination with water
  - Especially with battery fires, large amounts of water seem to be needed
  - Fires also last long and batteries may reignite
  - Water will increase of vaporisation rate in case of liquefied gas
  - Is cooling & penetration capacity enough
  - Reduction of fire risks of gaseous energy sources (explosion)
Water mist

• Testing:
  – Fire tests with
    • Batteries
    • Mock-up with reference fire load
    • Gas flames
  – With and without water mist
  – May emerge to new reference
  – Good opportunity for water mist industry to show with new risks
  – Will also be tested in CFD

Conclusions
Conclusions

• There is very high interest towards NECs due to environmental and related political interest
• The fire risks are relatively little studied with NECs
• NECs are developing quickly and they will impact to many facilities such as underground infrastructure
• SUVEREN research project is for studying the fire safety of NECs

Conclusions

• Water mist is part of SUVEREN research project.
  – Tested against battery fires
  – Tested against design fire load of representative new energy passenger vehicle
  – Water mist has potentially some benefits against NEC fires
• The keyword are same promoted by water mist and NEC industry – „Environmental friendliness“