Hazardous Material
Yesterday and tomorrow

Hazmat Commission
10th November 2018, Brussels
Hazmat commission

• Exchange experience and knowledge of each member state
  • Lessons learned
  • Good practice
• Working groups on special topics
• Information papers
• Lobbying for first responders

SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
Strong relations, national and international

• Country/international hazmat commissions
• Local ministries and association
• „Sister“ commissions in neighbouring countries
• International firefighting relations
• TUIS (support system from chemical industry in case of accident)
• ICE (International Chemical Environment)
• Factories,...
Hazmat in the past times

• Clearly classifiable
• Easy visible
• Industry, road, factories
„Historical“ tasks, example

- Old house
  - > 100 years old
- Renovation in basement ongoing
- Workers cut off pipes from a machine
- Gas/liquid running out
- Strong odor
  - eyes and breath irritating
- >100 flats evacuated
Main room
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separate room
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drive shaft

ball

cylinder

Pipes to separate room

„Frozen substance“
Solution

- Father Marcel Audiffren, physicist
- Coming up with a device to keep liquids cool
- 1894 granted a patent for machine-cranked unit

- His patents purchased by Brown Boveri C. and General Electric, offered for sale to public, 1911

- First closed cooling system running with

Sulfure dioxide $SO_2$

AEGL 2, 4h

0.75 ppm

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http://vhkk.org/page/vortrag/pdf/A-S_Rotor_CCI.pdf
Autor: Adalbert Stenzel
- Renovation in basement
- Workers found heavy bootle
- Called fire fighters two days later at midnight
- IED officer -> no bomb
- ?
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Topics in an modern environment

- Known or unknown dangers
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Dangerous goods pillars

Firefighters  Hazmat teams  Specialists
Awareness for first responders

Safety?

• Hazmat
  • Education
  • Training
• Stay healthy
  • Health prevention
  • Fitness
  • Nutrition

... SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
Awareness for first responders

Security?

- Normal hazmat „life“
- „Invisible“ hazmat operations
  - „Amateur scientist“ home laboratory
    - (Crystal Meth, Improvised Explosive Devices (IEDs),...)
  - Chemical suicides
    - (H₂S-Hydrogen sulfide, CO-Carbon monoxide,...)
  - Toxic industrial chemicals and material
    - TIC‘s/ TIM‘s
- Active shooter scenarios
- Fire as a weapon,....
- „Impersonation of First Responders“
- ....

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Alternative fuels and engines
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Hazard?!

- High voltage batteries (~1000V DC)
- Flammable
- Reaction with water?
- Corrosive
- Deep temp. (< minus 260°C)
- High pressure (~900bar)
- Cancerogen
- Toxic
- ...
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SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS

Possible Fuels:
- Fuel, Diesel, LPG, CNG, LNG
- Ethanol, Hydrogen, Methanol

Plastic, Carbonfibres
In case of fire or cutting

Belt pretensioner
Airbags: Side, windows, …
Active Hood

PRD*

Engines

Batteries

Gas cylinders

High voltage

Special areas?!
Location of the accident

• Free space
• Garage
• Storage
• Factory
• Tunnel
• ,....

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Danger identification?!

- Labelling
- Smell
- Noise
- Flame colour
- Detection
- …
Actions after fire with alternative fuels/ engines/ batteries

• Detection
• Far distance
• Decon
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High pressure gas cylinders?

• Hydrogen/CNG/,... tanks
• Stable after
  • mechanical impact or
  • fire

• Pressure relief?
• Shooting/explosives/disruptor ,...
Lithium Batteries

• Primary cell/battery or non-rechargeable is supplied fully charged and discarded once discharged
  • Flammable metall, react with water (Hydrogen!)

• Secondary cell, rechargeable battery, storage battery or accumulator which can be charged, discharged into a load, and recharged many times
  • Flammable, toxic electrolyt, current

• Storage of old batteries is a challenge
Lithium primary cell

- Non-rechargeable
Flammable metall inside, react with water (Hydrogen!)
Lithium **secondary** cell

- Rechargeable

Temperature 🔴 Smoke/ gas development 🔴 possible fire 🔴

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Thermal runaway?!
Lithium batteries, preventative fire protection?!

Storage:
- Separate
- „against flying batteries“
- fire compartment,
- fire-extinguishing system,...
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30 kg old primary cells, self reaction in waste factory
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www.firefighter.at
Electronic shipping papers

- Memorandum of understanding
- Some countries

- HIN/EAC
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SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
Example

SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
Example

www.fcsnwa.org

FireFighter Cancer Support Network Washington Chapter

HEALTHY IN, HEALTHY OUT
Best Practices for Reducing Fire Fighter Risk of Exposures to Carcinogens

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Health prevention behaviour

- Pre and post operation
- Station, fire house
- Low and higher cost ways
  - ,...
Healthy In, Healthy Out —

SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
Healthy In, Healthy Out —

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Risk and challenge in the CBRNE field
Risk and challenge

• CBRNE agents with UAV
• Never ending variations
• Bringing the „hot zone“ everywhere
• „Fire and forget“
• Difficult defense
Toxic Industrial Material “TIM’s”

• Radiological sources and isotopes

• Biologically produced substances

• Chemical products
  • Toxic industrial chemicals

• Enriched nuclear material

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Toxic industrial chemicals “TIC´s”

• Include chemicals manufactured for use in industrial, commercial, or medical processes.
• Manufactured, stored, transported, used throughout the world
• Gas, liquid, or solid state
• Chemical hazards and physical hazards
  • carcinogens, reproductive hazards, corrosives, flammable, combustible, explosive, reactive,...
Classification

• High Hazard
  Widely produced, stored or transported
  high toxicity and is easily vaporized.

• Medium Hazard
  • high in some categories, lower in others
  • number of producers, physical state, or toxicity.

• Low Hazard
  • not likely to be a hazard
  • specific operational factors indicate otherwise.
Examples for TIC’s

• High Hazard
  • Ammonia, Chlorine, Carbon disulfide, Ethylen oxide, Hydrogene chlorine, -fluorine, -sulfide, -cyanide, Nitric acid, Phosgene, Phosphorus trichloride, Sulfur dioxide, Sulfuric acid,…

• Medium Hazard
  • Acrylonitrile, Carbon monoxide, Chloroacetonitrile, Methyl isocyante, Phosphine,…

• Low Hazard
  • Bromine, Chlorine trifluoride, Dimethylsulfate, Hexachloropentadiene, …

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Consequences to consider

• Release of liquid or solid
  • soil / water contamination
  • drink water pollution

• Release of vapors or gas
  • heavy gas spreading
  • toxification of population and animals
  • sensitive public installations

• Fire / Explosion
  • fire, pressure/ blast wave, missiles
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Action plan?!

- Guidelines for high consequence dangerous goods
- Far distance detection devices
- GPS/... tracking telematic
- Awareness training
- Prehospital preparations
- Mass decon
Chemical suicides
Suicide international 
WHO Fact sheet 2018

• ~800,000 people die worldwide.
• For every suicide there are many more people who attempt suicide every year (10 to 30 times).
• Suicide is the second leading cause of death among 15–29-year-olds.

• 79% of global suicides occur in low- and middle-income countries.
• Ingestion of pesticide, hanging and firearms are among the most common methods of suicide globally.

• ~around 20% of global suicides are due to pesticide self-poisoning
Suicide international, WHO 2016

Age-standardized suicide rates (per 100,000 population), both sexes, 2016

Suicide rate (per 100,000 population)
- <5.0
- 5.0–9.9
- 10.0–14.9
- Data not available
- ≥15.0
- Not applicable

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not be full agreement.

Data Source: World Health Organization
Map Production: Information Evidence and Research (IER)
World Health Organization

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Werther-effect / Papageno effect

- The **Werther effect** not only predicts an increase in suicide, but the majority of the suicides will take place in the same or a similar way as the one publicized.
- The more similar the person in the publicized suicide is to the people exposed to the information about it, the more likely the age group or demographic is to die by suicide.
- Upon learning of someone else's suicide, some people decide that action may be appropriate for them as well, especially if the publicized suicide was of someone in a similar situation as them.

- The **Papageno effect** is the effect that mass media can have by presenting non-suicide alternatives to crises.
- It is named after a lovelorn character, Papageno, from an 18th-century opera (Mozart). This character was contemplating suicide until other characters showed him a different way to resolve his problems.
Types of Asphyxiants

Simple
- Helium
- Butane
- Carbon dioxide
- Nitrogen

Cellular
- Carbon monoxide
- Cyanides
- Phosphine
- Hydrogen sulphide

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Location

Small volume of the room have bigger effect
Real missions

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„Bring FF to court if they do a reanimation“

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SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
## Summary of Dangers

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Gas Hazards</th>
<th>“Off gassing” hazard from body?</th>
<th>Suggested PPE (risk assess)</th>
<th>Gas Odour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helium inhalation</td>
<td>Asphyxiant</td>
<td>No</td>
<td>Fire kit</td>
<td>No</td>
</tr>
<tr>
<td>Hydrocarbon inhalation</td>
<td>Asphyxiant, flammable</td>
<td>No</td>
<td>BA and fire kit</td>
<td>No (odourants added)</td>
</tr>
<tr>
<td>Carbon monoxide inhalation</td>
<td>Asphyxiant, very flammable</td>
<td>No</td>
<td>BA and fire kit</td>
<td>No</td>
</tr>
<tr>
<td>Potassium/sodium cyanide ingestion</td>
<td>Asphyxiant</td>
<td><strong>YES</strong> HCN produced</td>
<td>BA and fire kit</td>
<td>Yes “almonds”</td>
</tr>
<tr>
<td>Hydrogen cyanide inhalation</td>
<td>Asphyxiant, very flammable</td>
<td>No</td>
<td>BA and fire kit</td>
<td>Yes “almonds”</td>
</tr>
</tbody>
</table>
## Summary of Dangers

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<tr>
<th>Chemical</th>
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<th>Gas Odour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium phosphide ingestion</td>
<td>Asphyxiant</td>
<td><strong>YES</strong> Phosphine produced</td>
<td>BA and Fire Kit</td>
<td>Yes “garlic, bad fish”</td>
</tr>
<tr>
<td>Phosphine inhalation</td>
<td>Asphyxiant, very flammable</td>
<td>No</td>
<td>BA and Fire Kit</td>
<td>Yes “garlic, bad fish”</td>
</tr>
<tr>
<td>Hydrogen sulphide inhalation</td>
<td>Asphyxiant, very flammable</td>
<td>Some - lungs</td>
<td>CPC?!</td>
<td>Yes “bad eggs”</td>
</tr>
</tbody>
</table>

*(CPC) chemical protective clothing*
“Exit” shops
Sidestep:
Carfentanyl/ Fentanyl

Fentanyl. 2 mg. A lethal dose in most people

SAFER CITIZENS THROUGH SKILLED FIREFIGHTERS
• Dangerous goods
• Awareness for first responders
• Detection/decon
• The „cloud“
• Exchange of knowledge/ training
• Cooperation „Together we are strong“
Thank you

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CTIF HAZMAT Commission
roman.sykora@wien.gv.at
Apps

- WISER
- SAFER mobile
- FIRST/ HAZMAT EVAC by ARA
- Nüssler
- ERG 201X
- Mobile REMM
- Farlige Stoffer
- Fire Table
- UNDAC handbook
- INSARAG
- ...
Sources

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- Presentation from Bill Atkinson
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- CTIF Hazmat Commission
- CTIF Extrication and New Technologie Commission
- Austrian fire brigade federation
- Wikipedia
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