VÉDELEM TUDOMÁNY

KATASZTRÓFAVÉDELMI ONLINE TUDOMÁNYOS FOLYÓIRAT

Proceedings of the Fire Engineering & Disaster Management Prerecorded International Scientific Conference

UNIVERSITY OF PUBLIC SERVICE

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Védelem Tudomány

Budapest

2021

University of Public Service
Faculty of Law Enforcement
Institute of Disaster Management

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Proceedings of the Fire Engineering & Disaster Management Prerecorded International Scientific Conference, Védelem online cooperated with the University of Public Service 23rd of February, 2021. Budapest, Hungary

Chair of the conference:

Colonel Dr. habil. Gyula Vass

Co- chairs of the conference:

Ágoston Restás, Qiang Xu, Alexandru Ozunu, György Heizler

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- György Heizler, Védelem Tudomány Journal
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- Zsuzsanna Kerekes, University of Public Service, Budapest, Hungary

Welcome speech by Colonel Dr. habil. Gyula Vass

Dear colleagues and friends/Ladies and gentleman,

My name is Colonel Gyula Vass, PhD., head of the Institute for Disaster Management and I am the Conference Chair of Fire Engineering & Disaster Management Pre-recorded International Scientific Conference. I wish that you are well, I am glad to open the Conference here in Budapest, Hungary at the University of Pubic Service. I am delighted to welcome so many of you. This period is uncertainty for the entire World due to Covid 19 Pandemic, which affected and modified our lives and activities for the past months and will probably be present in the near future. Due to the pandemic, it is understandable that this conference will be quite different from previous conferences, although we can already find several examples for online conferences in international level. One of the features of such conferences is that at the time of the conference, presenters are not required to be present in real time, even in the virtual conference space, due to the fact that the presentations will be available in pre-defined videos on a pre-defined platform. The primary goal of our Fire Engineering & Disaster Management Pre-recorded International Scientific Conference is to present the actual researches in the field of Fire Engineering, Fire Protection accordingly lectures related to the fire protection will dominate during the conference, but covering the educational portfolio of the University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, there will also be presentations in the topic of the Disaster Management and Security developed at the scientific level. The language of the conference is English.

The following 5 topics were created at the conference:

1. Fire engineering
2. Fire protection
3. Firefighting and rescue operations management
4. Disaster management
5. Safety and security

These topics are including more sections, chaired by the chairman and co-chairs.

I sincerely hope you will enjoy the conference! I wish you all a very fruitful conference!

Colonel Dr. habil. Gyula Vass
Chair of the conference

Overview of the conference

Section A – Fire engineering

Subsection 1

Chair: Gyula Vass, Co-chair: Ágoston Restás

1. Xu Quiang: Evaluate the Flammability and Fire Behavior of Wood of Ancient Buildings
2. Flóra Hajdu - Gabriella László - Zsuzsanna Kerekes - Nikoleta Csápaiová - Rajmund Kuti: Examination of fire spread in simulation environment
3. Katalin Kopecskó: The vulnerability of Portland cement, the advantage of geopolimer
4. Ádám Nagysolymosi - Katalin Kopecskó - Zsuzsanna Kerekes - Ágoston Restás: Structural changes of fiber-reinforced composite plastics under the influence of heat

Subsection 2

Chair: Qiang Xu, Co-chair: Zsuzsanna Kerekes

1. Balázs Nagy - Gergő Érces - József Hesz: Evaluation of BIM-based workflows in fire safety engineering
2. Norbert Érces - László Kajtár: The impact of a conventional operated biomass boiler on the environment
3. Ágoston Restás - Edit Lucza - János Szép - Zsuzsanna Kerekes: Reuse of Polyethylene Waste as Building Material in view of Fire Protection
4. Oisik Das – Ágoston Restás - Michael Försth - Gabriel Sas - Mikael Hedenqvist: Naturally - occuring Bromophenol to develop fire retardant gluten bioplastics

Subsection 3

Chair: Katalin Nagy, Co-chair: Éva Lublóy

1. Judit Veresné Rauscher: Evacuation scenarios and repeated runs for evacuation simulations
2. Gyula Vass - Gergő Érces - Sándor Rácz: Fire protection in smart cities
3. Katalin Nagy: How Different Kinds of Built-in Fire Prevention Equipment Work Together
4. Jinheng Xu: Tree Seed Fibers Flammability Analysis by MCC and TGA

Subsection 4

Chair: Oisik Das, Co-chair: Gergő Érces

1. János Gyapjas - Regina Haris: Fire Safety in building construction
2. Péter Tóth: New Hungarian standard for testing facade fire propagation
3. Jozef Svetlík–Makovická Linda Osvaldová: Temperature on car doors exposed to fire – pre-test
4. Andrea Majlingova - Patryk Tischler: Compartment Fire Modelling

Section B – Fire protection

Subsection 1

Chair: Zoltán Rajnai, Co-chair: Ferenc Kanyó

1. Zsófia Tóth-Pataki - János Szép - Zsuzsanna Kerekes - Ágoston Restás: Role of radiation heat in the thermodynamic classification of polystyrene thermal insulators
2. Mónika Szalai: Danger of dust explosion and importance of testing for explosive dusts
3. Viktor Hlavicka: Cracks in normal strength concrete and mortar subjected to elevated temperatures
4. Makovická Linda Osvaldová: Determination of selected fuel values of wood in case of forest fire in an area of natural disaster

Subsection 2

Chair: Anthony Gall, Co-chair: László Bérczi

1. Zsófia Raffai – Hermina Horváth: Examination of the transport of high consequence flammable dangerous goods
2. Nikoletta Ragács - Zsuzsanna Kerekes - János Szép - Ágoston Restás: Effect of Thermodynamic Behavior of Isolation Materials on smoke generation
3. János Gyapjas - László Bérczi – Regina Zsófia Haris: Heat and smoke extraction from the point of view of the fire protection authority, in terms of with obtaining occupancy permit
4. Krisztina Komlai - Ágoston Restás - Zsuzsanna Kerekes: Fire Resistance Thermodynamic Test of Self-supporting Double Skin Metal Faced Sandwich Panels

Subsection 3

Chair: Linda Makovicka Osvaldova, Co-chair: Lajos Takács

1. Péter Debreceni: Review of National Forest Fire Prevention System in Hungary Innovative Strategies for Fire Prevention
2. Péter Tóth– Péter Pántya: The role of ÉMI LLC. in Hungarian fire protection
3. Rhoda Mensah: Advances in Assessment Methods for Fire Safety
4. Péter Pántya: Issues of energy sources in the field of Fire Protection

Subsection 4

Chair: Verica Milanko, Co-chair: József Hesz

1. Péter Pántya: Basics of the fire protection of alternative energy sources
2. Lajos Király - Ágoston Restás: Examination of ATEX rule changes in Hungary
3. Nikoletta Ragács – Szép János - Zsuzsanna Kerekes - Ágoston Restás: Thermodynamic behavior of isolation materials exposed to radiation heat
4. Mónika Nováky: Analysis both of the Official Fire Protection and Special Fire Protection Authorities in the System of Integrated Disaster Management

Subsection 5

Chair: Martin Zachar, Co-chair: Géza Zólyomi

1. Seeranm Ramakrishna – Oisik Das – Ágoston Restás: Microscale Combustion Calorimetry (MCC)
2. László Bérczi – Diána Farkas: Research on the development of the fire investigation procedures
3. István Mészáros - Lajos Kátai-Urbán - Zsolt Cimer – Gyula Vass: Hospital evacuation

Section C – Firefighting and rescue operation management

Subsection 1

Chair: Andrea Majlingova, Co-chair: Péter Pántya

1. Balázs Stocker - László Bodnár: Shortcomings in cooperation during the marching of the fire engine
2. Zsolt Huszka – Sándor Rácz: Presentation of occupational safety solutions against hazards during the firefighting
3. László Bodnár: Physical load test of firefighters based on the carried overload
4. József Kersák - Péter Pántya: Technical development opportunity in the field of practical training in rescue fire protection

Subsection 2

Chair: Danica Kacikova, Co-chair: Sándor Rácz

1. Patricio Sanhueza: Issues about the wildfire situation in Chile
2. Levente Gál - Sándor Rácz: Presence of Factors Influencing a Decision Based on Signals of the Fire Alarm System
3. Roland Bánhegyi - Sándor Rácz: Firefighting in case of solar panels
4. Máté Rekeny - Ágoston Restás: Comparative Effectiveness Analysis of Fire Engines Focusing on Forest Fires

Subsection 3

Chair: Siviwe Shwababa, Co-chair: László Bodnár

1. György Kós: Rapid Fire Progress (RFP).
2. Johanna Farkas: Coping strategies of firefighters
3. Bilha Muchiri: Fire Investigation and Response in Muranga County, Kenya: Success and Challenges
4. Tamás Igaz-Danszky - József Hesz: Development of Operation Control at Hungarian Disaster Management

Subsection 4

Chair: Jayne Kamau, Co-chair: Rajmund Kuti

1. Róbert Urszuly: Extinguishing fires from solar systems
2. Alexander Fekete - Péter Pántya: Fire, multi-risk and technical rescue needs in Germany and Hungary. Organizational differences and similarities
3. Péter Pántya: Extra load and limitations by the PPE’s on the members of the Fire Protection
4. Roland Veszprémi – Péter Pántya: Fire interventions at railways

Subsection 5

Chair: Ferenc Varga, Co-chair: László Pimper

1. Tamás Miskei: Intervention challenges in cases of fire and damage to electric vehicle charging stations
2. Ishan Al-Khawaldeh - Restás Ágoston: Forest Wildfire Crisis Management
3. Tomasz Zweglinski – Péter Pántya: LNG conditional scenario flow model for incidents in road transport
4. Péter Tomka – Péter Pántya: Identifying Firefighters and Vehicles on the Fire ground

Section D – Disaster management

Subsection 1

Chair: Ozunu Alexandru, Co-chair: Árpád Muhoray

1. Árpád Muhoray: The 20 years of the Hungarian Disaster Management
2. Zoltán Török - Alexandru Ozunu - Cristian Malos - Andrei Radovici: Natech Risk at Romanian Seveso establishments and industrial parks
3. Csaba Almási - Gyula Vass - Lajos Kátai-Urbán: Transport of materials belonging to ADR Class 3 with agricultural tractor in Hungary
4. Mikulas Monosi - Jaroslav Flachbart: Drone application in extreme conditions

Subsection 2

Chair: Tomasz Zweglinski, Co-chair: Lajos Kátai-Urbán

1. János Petrányi - Attila Zsitnyányi - Gyula Vass - Lajos Kátai-Urbán: New capabilities in the Hungarian Radiation Early Warning and Monitoring System
2. Ahmad Alhosban – László Bodnár: The Adopted Approach to the disaster management of Covid-19 Pandemic in Jordan /role of the National Center for Security and Crisis Management (NCSCM)
3. Dávid Nemes: Case Study of Drone Applications Supporting Preventive Flood Management in the Rakaca Water Reservoir
4. Siviwe Shwababa: Enhancing Disaster Preparedness in the midst of the Covid -19 Pandemic

Subsection 3

Chair: Zoltán Török, Co-chair: József Ambrusz

1. Hermina Horváth - Lajos Kátai-Urbán – Gyula Vass: Investigation of fire safety aspects of dangerous goods shipments
2. Réka Kirovné Rácz: The Correlation of Climate Change and the Disasters due to Precipitation in Hungary
3. Bernardo Castro: Challenges of the disaster management in Chile
4. Réka Kirovné Rácz: Drought and Desertification as a Disaster

Subsection 4

Chair: Izabela Gabryelewicz, Co-chair: Galina Horváth

1. Nóra Szűcs-Vásárhelyi - József Dobor - György Pátzay: Demonstration of hazardous soil contaminants from a disaster management perspective
2. Kátai-Urbán Lajos - Zsolt Cimer - Ádám Berger: Remediation board versus protective ring
3. Alice Ncube – Joyce Jamila Ndovella: Resilience mechanisms displayed by informal settlement dwellers towards shack fires in South Africa
4. László Teknős: Analysis of evaluation of the relation between agriculture and Disaster Management

Subsection 5

Chair: Patryk Krupa, Co-chair: Júlia Hornyacsek

1. Lajos Kátai-Urbán – Zsolt Cimer – Zoltán Cséplő – Gyula Vass: Examination of the technical competencies required to fulfill the industrial safety responsibilities
2. Chris Hetkämper: How to locate central service points for emergency services?
3. Tamás Parrag - Lajos Kátai-Urbán - Zsolt Cimer: Environmental safety effects of micropollutants and microplastic
4. Zsófia Kugler: Activity of the Knowledge Centre for Water Sciences and Disaster Prevention

Section E – Safety and security

Subsection 1

Chair: Alexander Fekete, Co-chair: Péter Ruzsonyi

1. Alida Kiss - József Ambrusz: Scientific research difficulties of post-earthquake rehabilitations
2. Julius Piwowarski: Security environment – theoretical model in Polish security sciences
3. Júlia Hornyacsek - Gergely Kovács: Application possibilities of Augmented Reality and Virtual Reality in the training of defense professionals
4. Kálmán Serfőző - György Pátzay - József Dobor: Disaster management representation and summary of the most important elements, controllers, systems and devices required for the operational safety of a fictitious hazardous plant

Subsection 2

Chair: Julius Piwowarski Co-chair: Gábor Kovács

1. Balázs Barina - József Dobor: Characterization, use and hazards of chemicals with dangerous properties that may occur in nuclear power plants
2. Noémi Kiss - József Dobor: Summary, characterization, potential hazards of radioactive isotopes, which are most often used in industry and healthcare
3. Alida Kiss - Orsolya Varga - László Bekő: Detection of post-earthquake building damages in Zagreb based on Sentinel-1 radar data
4. Gábor Patai - Sándor Rácz: Accidents in case of prison transport at penal institutions from the perspective of firefighters

Subsection 3

Chair: Johannes Belle, Co-chair: Alice Ncube

1. Katalin Berta: Involvement of animal rescue organizations in disasters
2. Izabela Gabrielawicz – Patryk Krupa – Péter Pántya: Safety management in terms of the level of safety culture in uniformed services
3. Roman Tandlich: A Brief Introduction to TIEMS International Certification - TQC
4. Dávid Petrétei: Victim identification after the Hableány disaster

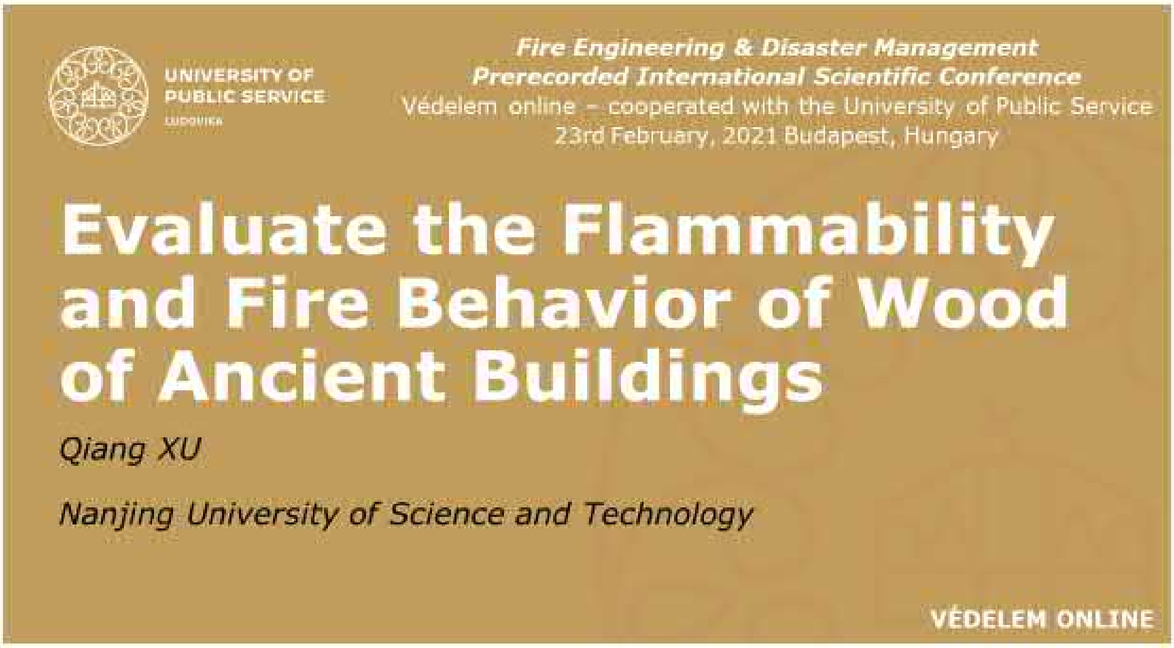
Subsection 4

Chair: Roman Tandlich, Co-chair: Wędrychowicz Maciej

1. Mirjana Laban - Vudakin Milanko –Vlastimir Radonjanin – Suzana Draganić: Knowledge for Resilent Society
2. Shariphanov Syrym – Shahuov Talgat - Assan Zhaulybayev: The composition of the human capacity flow and Mosque for safety assessment of escape
3. László Manga – Lajos Kátai – Urbán – József Solymosi: Radiation protection devices for nuclear emergency preparedness

Section A – Fire engineering

Qiang Xu: *Evaluate the Flammability and Fire Behavior of Wood of Ancient Buildings*



Contents

Abstract

Wood is one of the main building materials of ancient architecture. The frequent ancient wooden building fires causes tremendous losses to the building itself and the cultural relics in the building. Exploring the law of fire occurrence and development of ancient wooden buildings is of great significance to ensure the safety of ancient buildings.

Introduction

Gongchen Building, China, built in 1390, on January 3, 2015, it caught fire and was destroyed

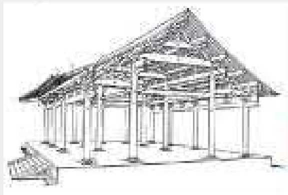
On Feb. 10, 2008, a lone man with a grudge against the government ignited a fire that struck the heart of a nation, destroying the 650 year old Great South Gate, National Treasure No 1.

Introduction

National Museum Fire, Sep.2nd 2018, Brazil

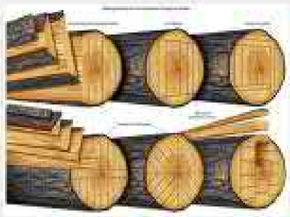
Brazil's Federal Police wrapped up an investigation into a 2018 fire at the National Museum that destroyed much of its **20 million** artifact collection.

Introduction

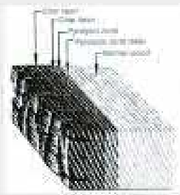
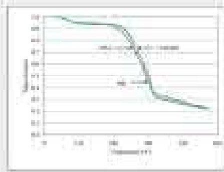
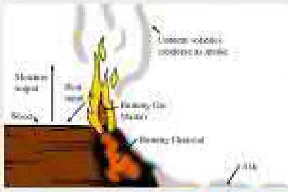


Introduction



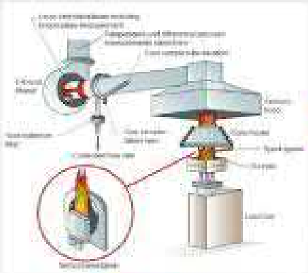
- Pyrolysis
- Ignition
- Heat release
- Combustion and fire spread

Flammability and fire behavior

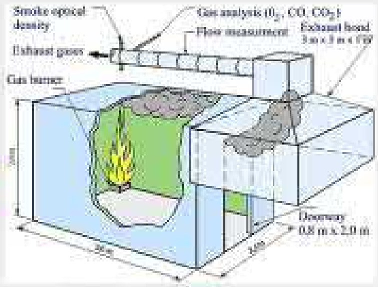





Methods

W g^{-1}



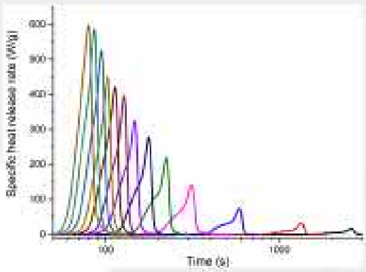
kW m^{-2}



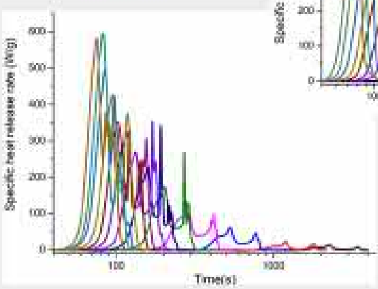
kW

Evaluate flammability and fire behaviour of wood by multiscale tests

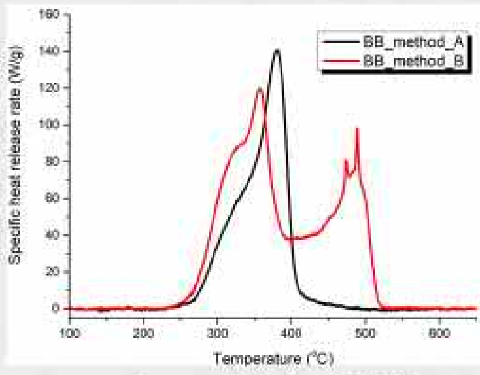
Discussion



Method A

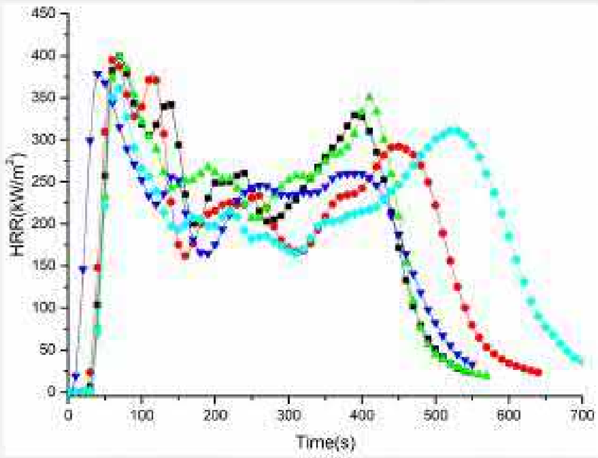


Method B

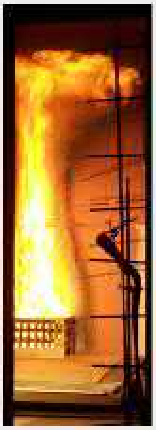


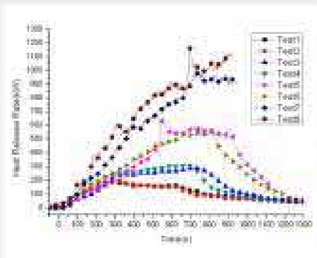
Compare of Method A and B, 1.0K/s

Discussion

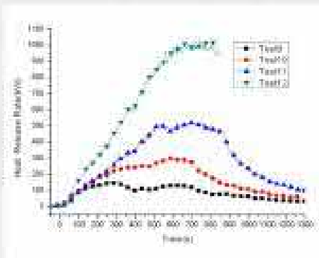


Discussion





Corner fire HRR

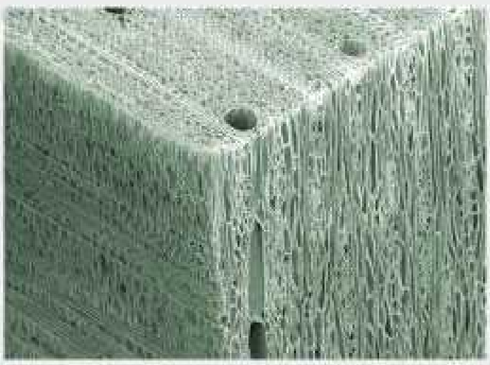


Center fire HRR

Discussion

How to figure out the flammability difference of new and ancient wood?

Discussion



- Component change
- Density difference
- Balance moisture content
- Difference of internal structure and internal specific surface area

The research is supported by

中华人民共和国科学技术部
Ministry of Science and Technology of the People's Republic of China

Key technological research of flame spread mechanism and monitoring evaluation of cultural relic building, National Key Research and Development Plan, No. 2020YFC1522800, 2020.10-2023.9

Research on fire behavior prediction of solid materials based on multi scales experimental analysis methods of flammability, National Natural Science Foundation of China, No.51776098, 2018.1-2021.12

Study of fire retardancy mechanism of fully bio-based novel biocomposites and its heat release kinetics model, NSFC (National Natural Science Foundation of China)-STINT (The Swedish Foundation for International Cooperation in Research and Higher Education) joint project, No. 51911530151, 2019.1.1-2021.12.31

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THANK YOU FOR YOUR ATTENTION!

uni-nke.hu

Flóra Hajdu - László Gabriella - Zsuzsanna Kerekes - Nikoleta Csápaiová - Rajmund Kuti: *Examination of fire spread in simulation environment*

Content of the presentation

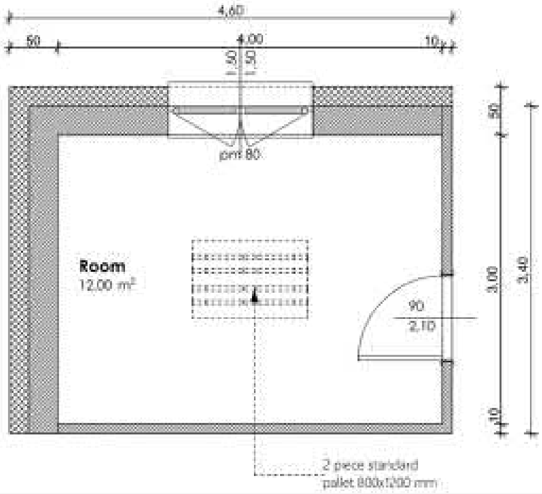
- Introduction of the presentation
- Research objectives
- Methods
- Results
- Conclusions
- References

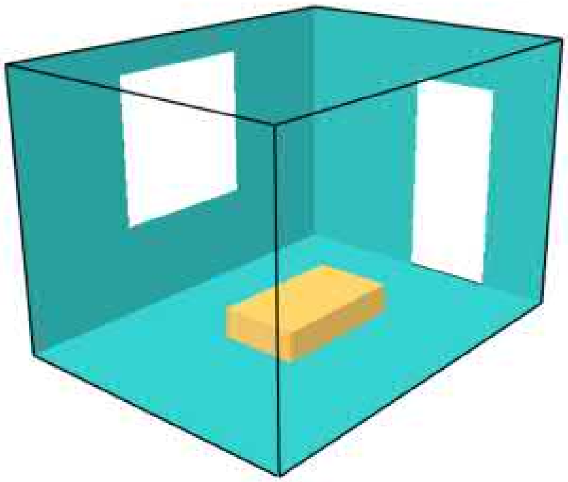
Abstract

- Aim of the research:
- Examination fires in buildings
- Understanding the combustion process and the spread of the fire
- Scientific examination of the negative effects of the heat load on the building structures
- Due to the environmental damage, it is very difficult to obtain permission for 1:1 scale fire experiments, but good results can also be achieved with computer simulation.
- In order to better understand the spread of fire and its effects on building structures, a model of a unit fire in a living room was examined in numerical simulation
- The model and the simulation process is explained in our presentation.

Examined room

Placement of temperature, O2 and CO2 sensor
XYZ=2, 1.5, 2.4





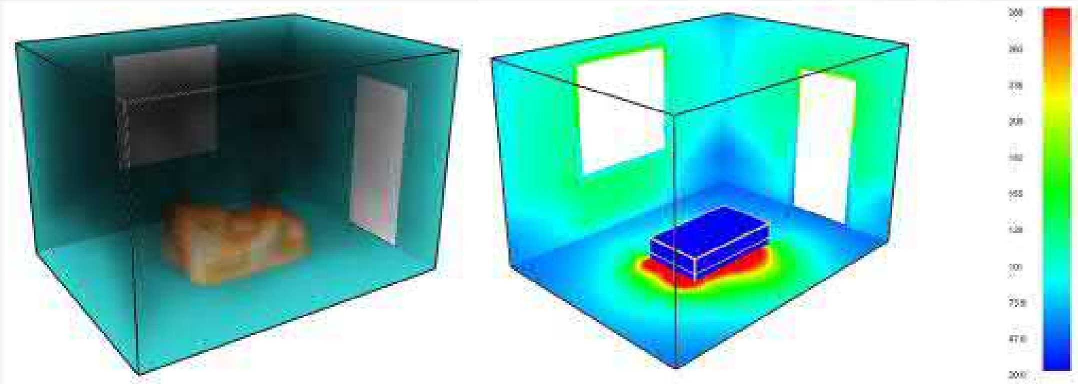
Burning materials

- In the middle of the room 2 standard pine pallets were placed

Material	Quantity (kg)	Ignition temperature (°C)	Heat of combustion (MJ/kg)	Densitiy (kg/m³)
Pallet (pine)	80	260	16.75	600-900

Simulation program

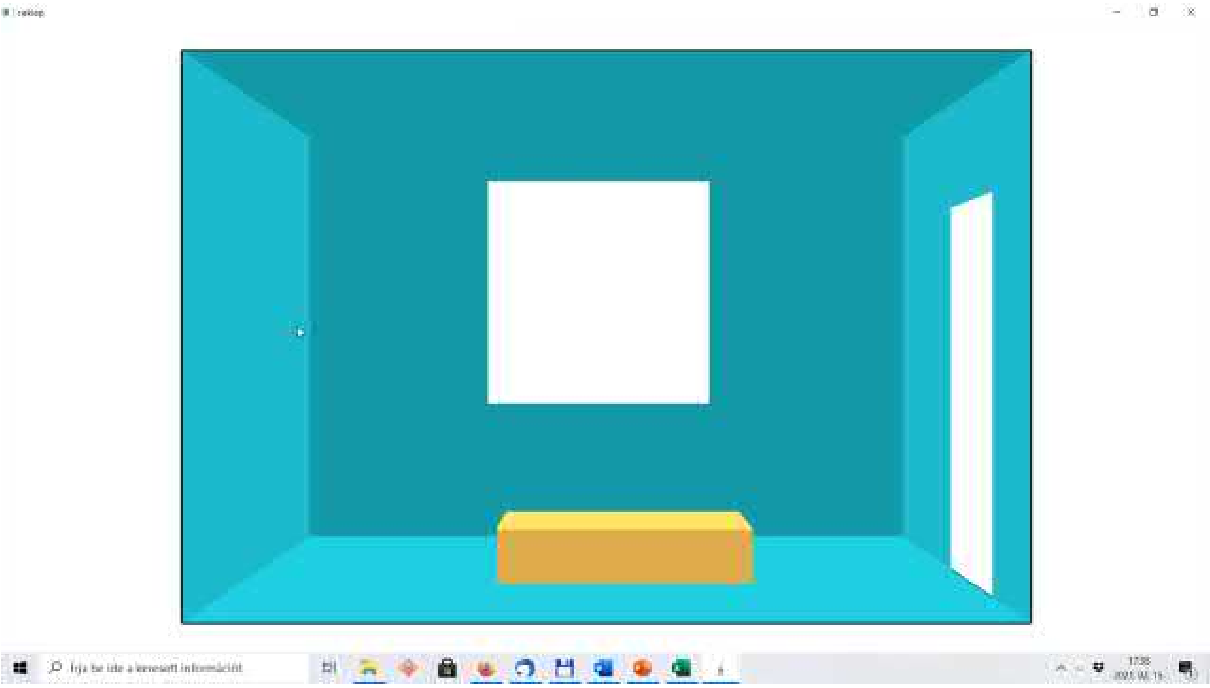
- FDS
- CFD program for fire and smoke spread simulation

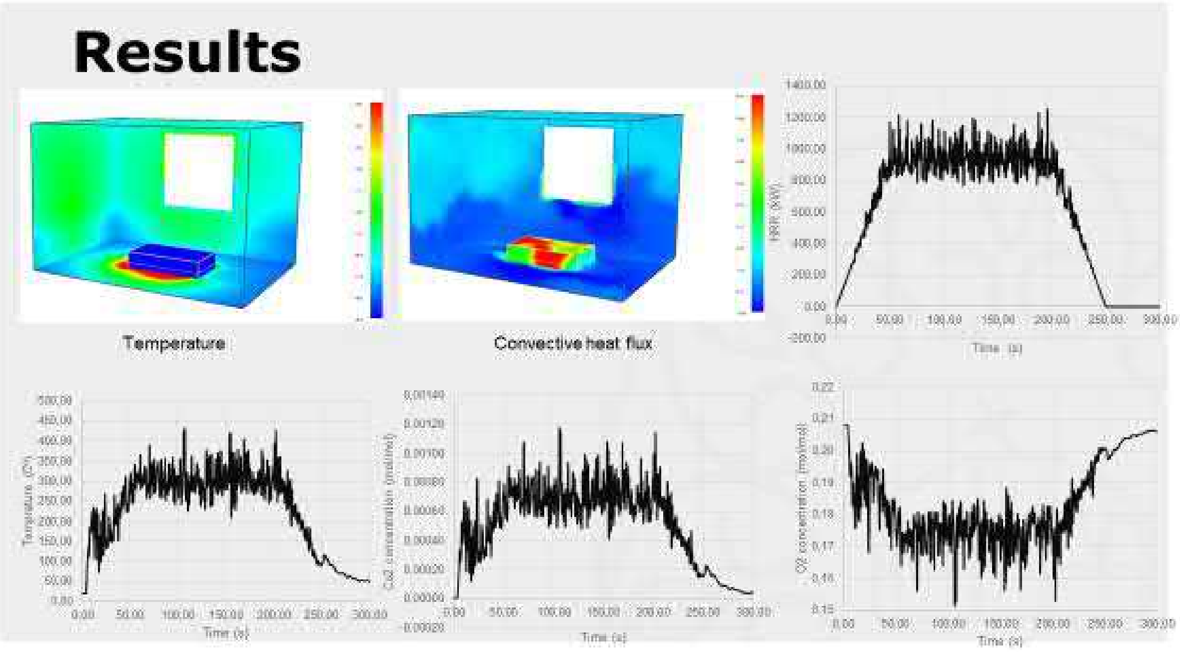


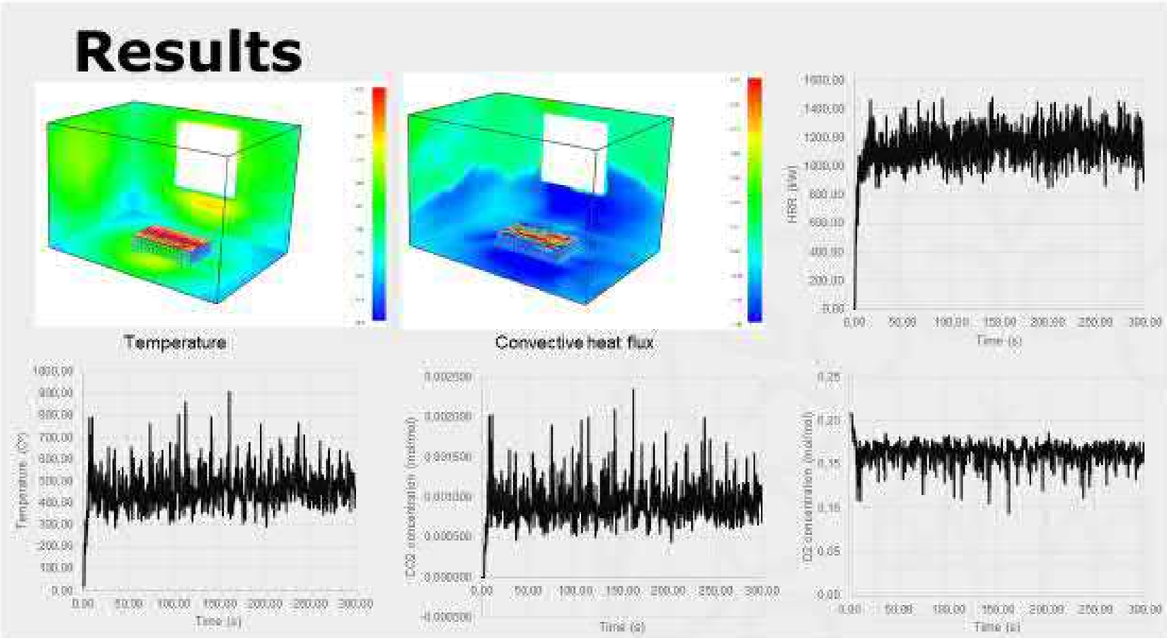
Simulation script

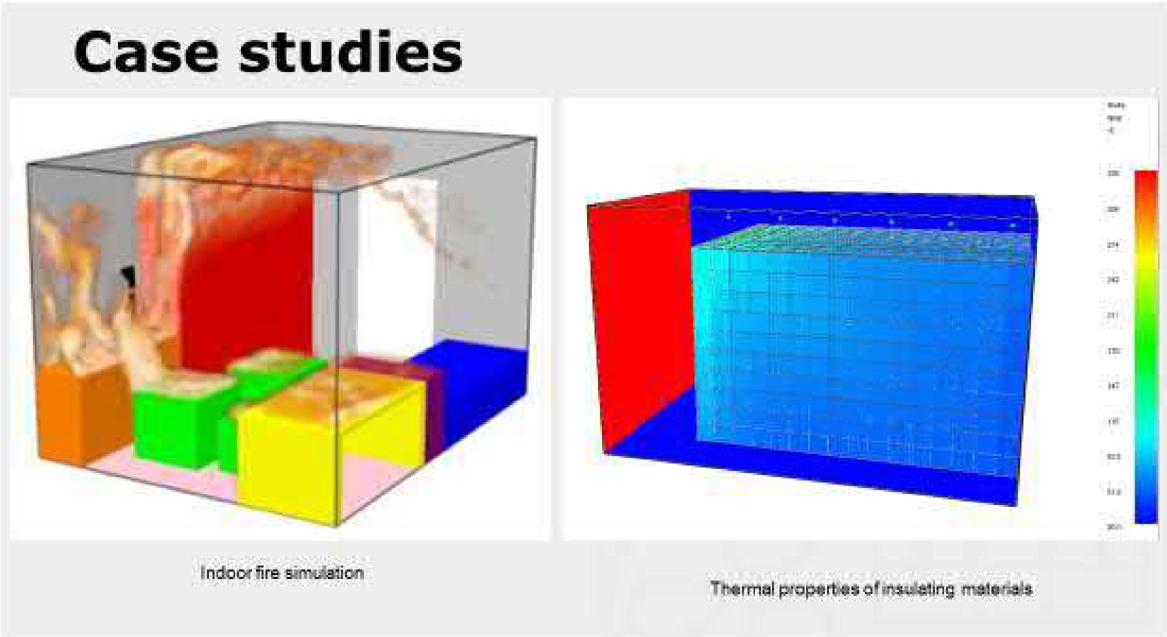
- Mesh size
- Time
- Reaction fuel properties
- Materials
- Surfaces
- Obstacles
- Openings
- Sensors

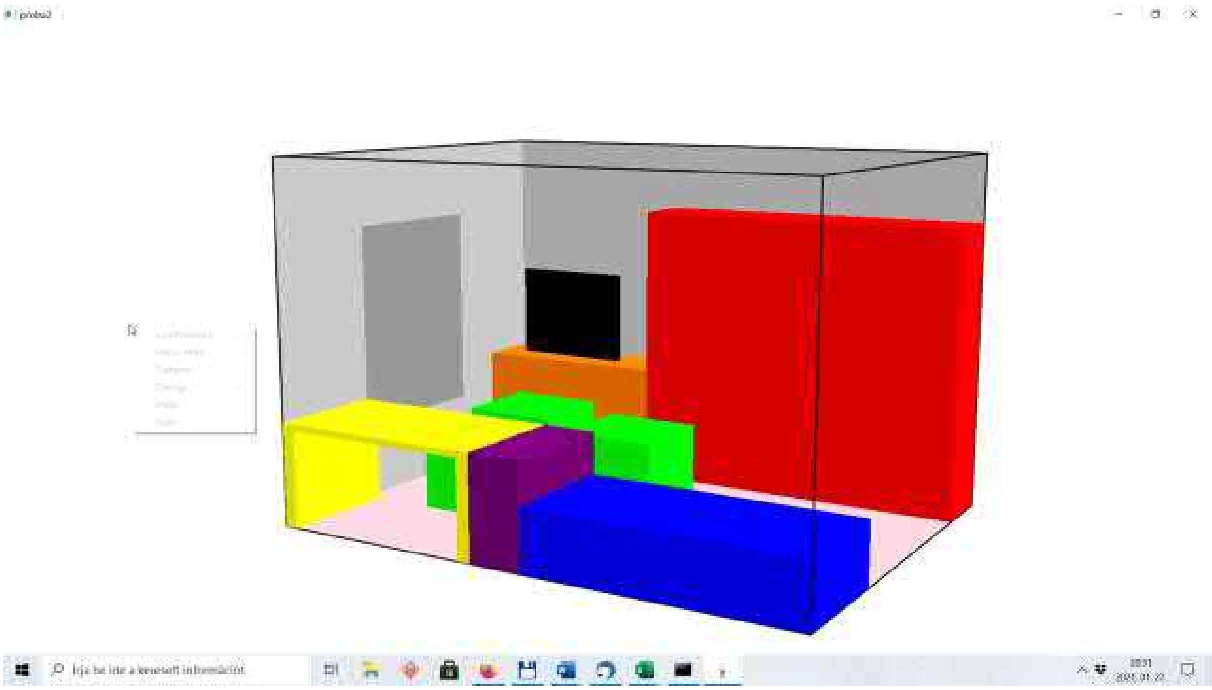
```
&SURF ID          = 'RAKLAP'
    FYI          = 'Properties completely fabricated'
    COLOR        = 'PURPLE'
    BURN_AWAY     = .TRUE.
    MATL_ID      = 'FA'
    THICKNESS     = 0.1,
    BURN_AWAY          = .TRUE. /

&SURF ID          = 'WALL'
    DEFAULT      = .TRUE.
    RGB          = 50,200,200
    MATL_ID      = 'GYPSUM PLASTER'
    THICKNESS     = 0.012 /

&SURF ID='FIRE', HRRPUA=400/

&OBST XB= 1.4, 2.8, 1.1, 1.9, 0.00, 0.140, SURF_ID='FIRE' / raklap 1

&OBST XB= 1.4, 2.8, 1.1, 1.9, 0.140, 0.280, SURF_ID='FIRE'/ raklap 1

&VENT XB= 1.2, 2.7, 3, 3, 0.9, 2.4, SURF_ID='OPEN' / ablak
&VENT XB= 4, 4, 0.7, 1.6, 0, 2.1, SURF_ID='OPEN' / ajtó

&BNDF QUANTITY='RADIATIVE HEAT FLUX' /
&BNDF QUANTITY='CONVECTIVE HEAT FLUX' /
&BNDF QUANTITY='NET HEAT FLUX' /
&BNDF QUANTITY='WALL TEMPERATURE' /
&BNDF QUANTITY='BURNING RATE' /
```




Results
Temperature
Convective heat flux
HRR (kW)
Time (s)
Temperature (C°)
O2 concentration (mol/mol)


Results
Temperature
Convective heat flux
HRR (kW)
Time (s)
Temperature (°C)
Time (s)
CO2 concentration (mol/mol)
Time (s)
O2 concentration (mol/mol)
Time (s)


Case studies
Indoor fire simulation
Thermal properties of insulating materials



Conslusions

- Modelling of unit fires
- Case studies: indoor fire spread simulation, fire properties of thermal insulating materials
- The parameters can be easily changed
- Fire protection planning
- A good starting point for 1:1 scale experiments
- Mesh size and material properties are important

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Kopecskó Katalin: *The vulnerability of Portland cement, the advantage of geopolimer*

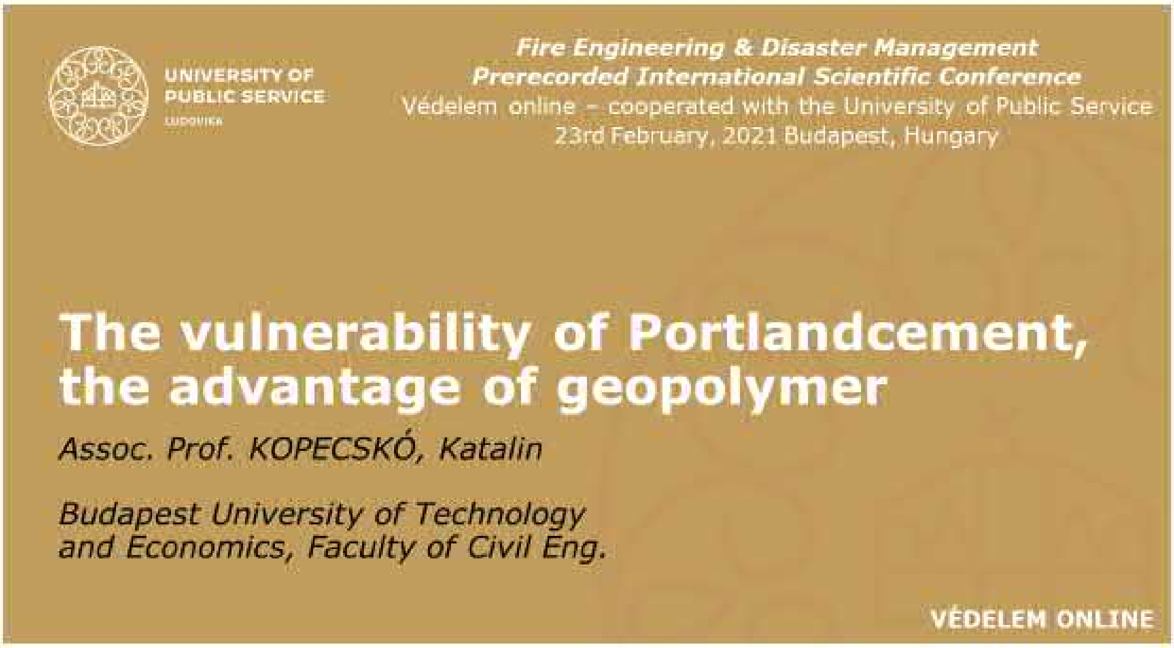
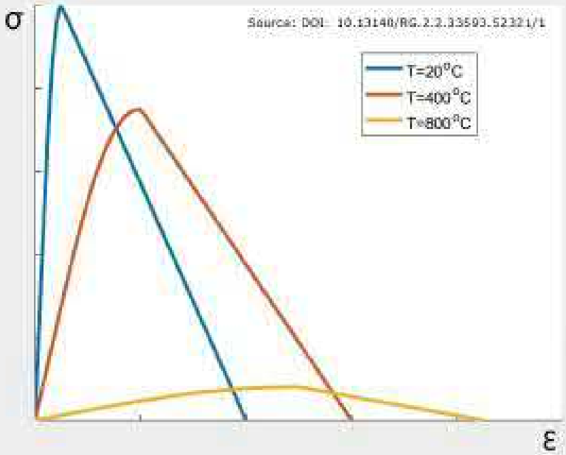


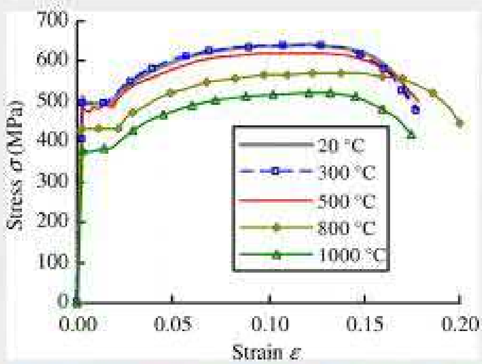
Table of content

Abstract

- The Portlandcement concrete suffers several undesirable changes when exposed to high temperatures.
- We can increase the resistance of concrete against high temperature with choosing geopolymer type (alkali activated) binders or cements.
- The structural transformations of the exposed materials can be proved by thermal (TG/DTG/DTA) and powder diffraction (XRD) phases analytical methods.
- The macroscopic features are determined by the microstructure, which can be visualized by Scanning Electron Microscopic (SEM) observations.

Introduction





https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29MT.1943-5533.0000676

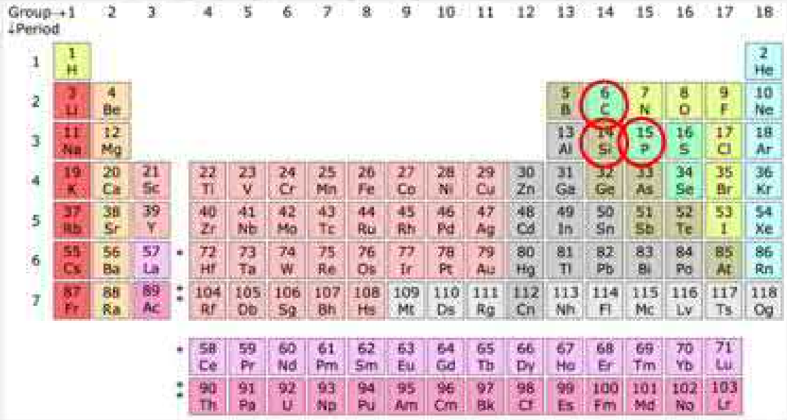
https://doi.org/10.1061/(ASCE)MT.1943-5533.0000676

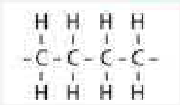
Stress-strain relationships of hot-rolled structural steel at elevated temperature according to Eurocode 3 (CEN 2005)

State-of-the-Art

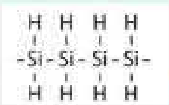
http://www.wagner.com.au

Similarities of C or Si chains





polyethylene



polysilane

Terminology

Gepolymerisation or **Alkali activation**
Liquid Stone, Man-made Rock

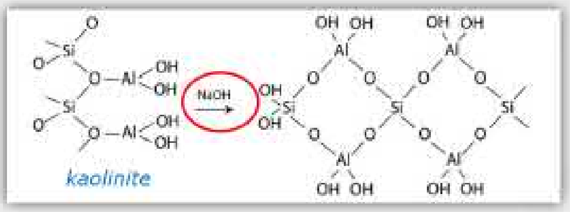
Source: http://en.wikipedia.org/wiki/Pumapunku

Terminology

Alkali-activation

chemical reaction between a solid aluminosilicate precursor and an alkaline activator, at room temperatures, giving a hardened product (*Shi et al. 2006*).

E.g. polycondensation (= chemical reaction)
of kaolinite (= solid aluminosilicate precursor) in NaOH (= alkaline activator).



The product is a geopolymer: hydrated sodalite (feldspar tectosilicate)

(*Davidovits, 2008*)

The importance of the topic

Second to water, **concrete** is the most consumed material in the world.

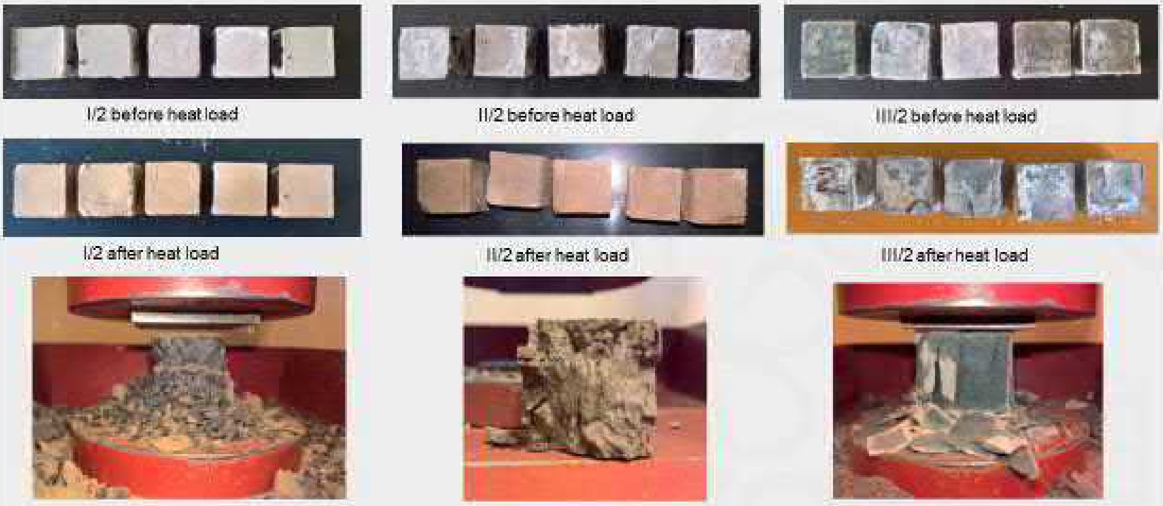
The binder for concrete is **cement**, which requires the mining of **primary sources**, and production involves **significant CO_2 emissions**.

There are many **industrial wastes** (slags, pulps, mining mullocks, ashes, muds), which can be used by processing as a **secondary sources** in binding materials.

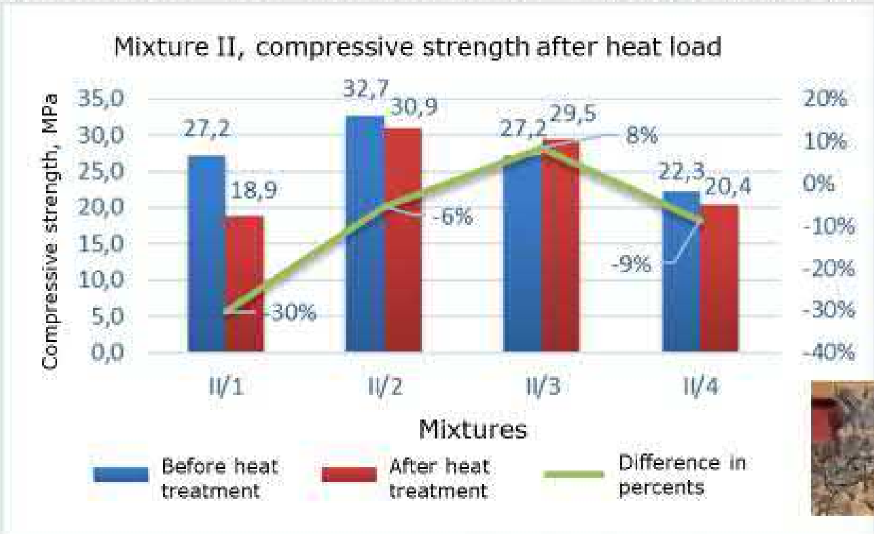
Efforts are being made worldwide to use these **secondary sources** of very different compositions as binders instead of traditional cement;
the **geopolymerization or alkali activation can be a solution**.

It was found that most geopolymer binders have **enhanced resistivity against high temperature**.

Geopolymer research at BME

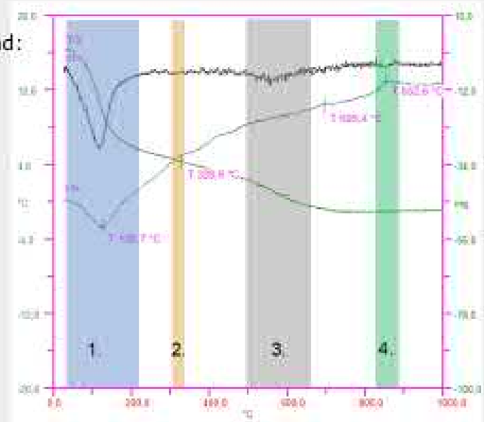


Exposure at elevated temperature

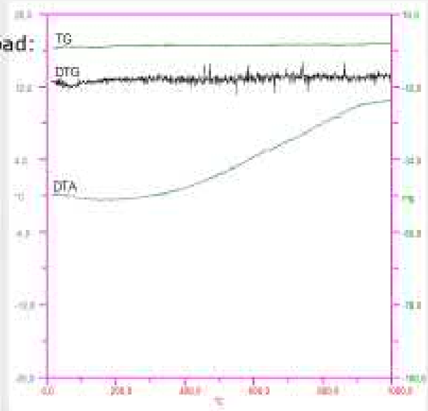


Structural change – TG/DTG/DTA

Before heat load:

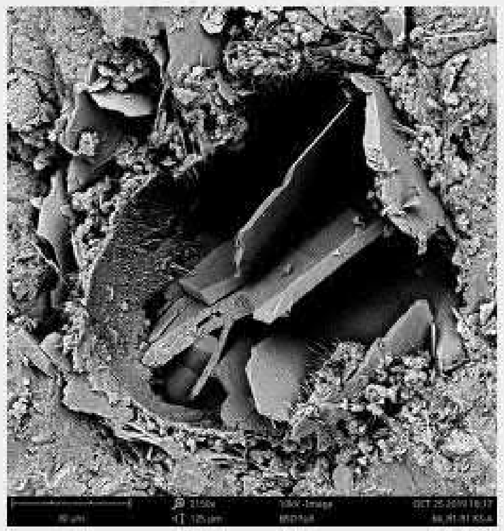


After heat load:



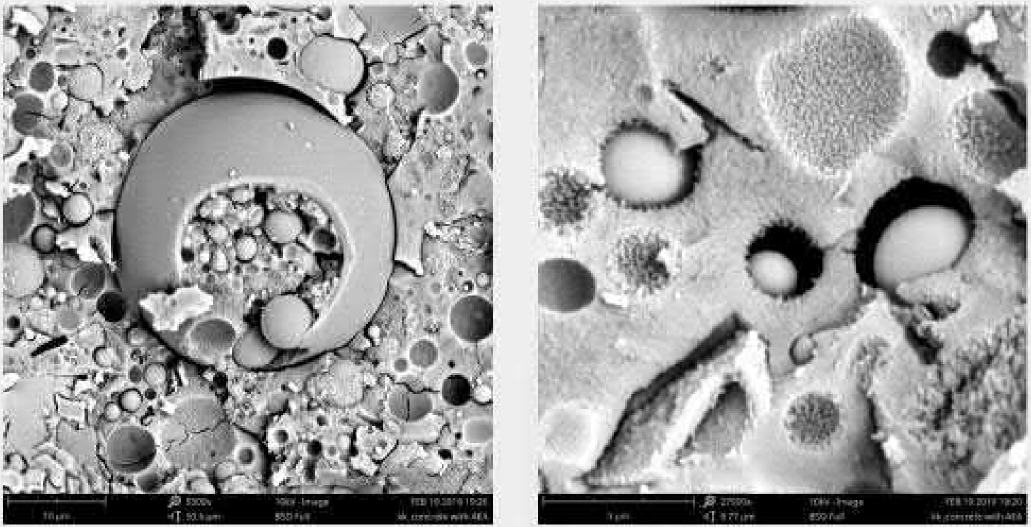
1: dehydration of N-A-S-H (Na_2O-Al_2O_3-SiO_2-H_2O) structure (endothermic)
2: structural transformation of the iron oxide content of the fly ash (hematite → magnetite, exothermic).
3: burnout of the residual carbon content of the fly ash (exothermic).
4: structural transformation (nepheline formation, exothermic).

Microstructure – SEM



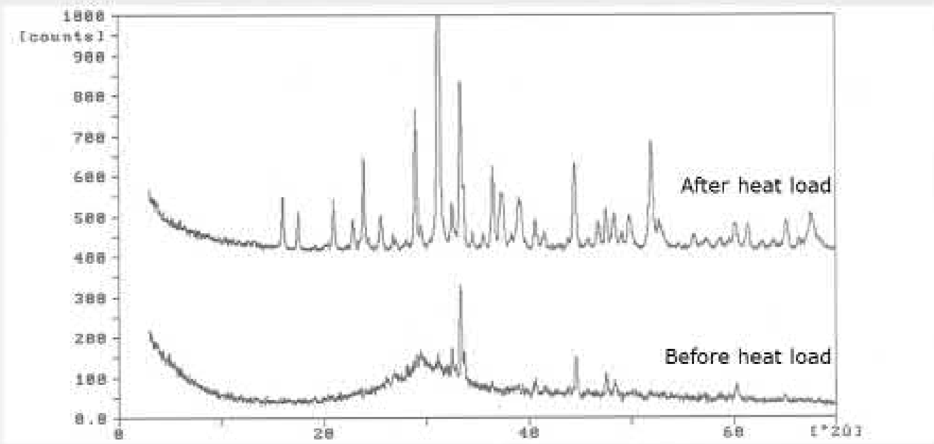
SEM pictures made by Katalin Kopecskó

Microstructure – SEM

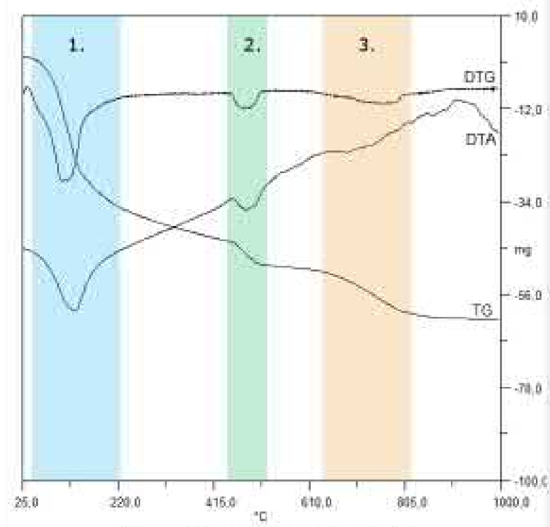


SEM pictures made by Katalin Kopecskó

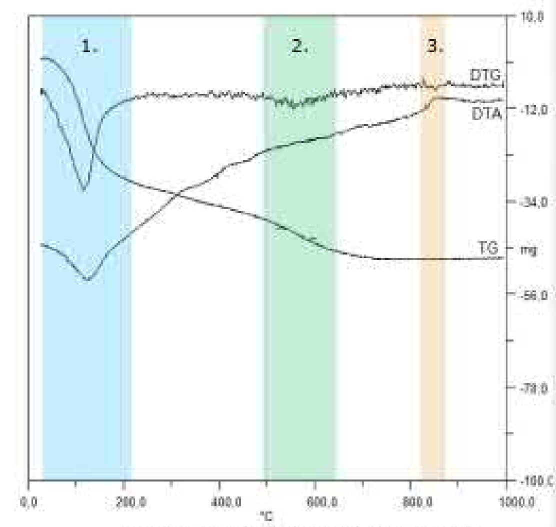
Structural change – XRD



Geopolymer versus cement



TG/DTG/DTA of hardened cementpaste



TG/DTG/DTA of hardened geopolymer paste

Conclusions

- The Portlandcement concrete suffers several undesirable changes when exposed to high temperatures.
- We can increase the resistance of concrete against high temperature with choosing geopolymer type (alkali activated) binders or cements.
- The structural transformations of the exposed materials can be proved by thermal (TG/DTG/DTA) and powder diffraction (XRD) phases analytical methods.
- The macroscopic features are determined by the microstructure , which can be visualized by Scanning Electron Microscopic (SEM) observations.

Acknowledgements

Author acknowledge the support by the Hungarian Research Grant NVKP_16-1-2016-0019 "Development of concrete products with improved resistance to chemical corrosion, fire or freeze-thaw".

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Ádám Nagysolymosi – Katalin Kopecskó – Zsuzsanna Kerekes – Ágoston Restás: *Structural changes of fiber-reinforced composite plastics under the influence of heat*

Structure of the presentation

1. Abstract
2. Introduction of the presentation
3. Test material samples (FRP) and their characteristics
4. Experimental methods
5. Test results
6. Conclusion

References

1. Abstract

In buildings, if a fire occurs, the building structures are exposed to some kind of enclosed fire effect, so they must also be dimensioned for heat load.

A common method of scaling is modeling, for which several material properties must be specified. It is necessary to know the behavior of the material against heat and fire. Knowing these, it is possible to calculate the strength reductions of the building structural elements.

2. Introduction of the presentation

Fibre reinforced polymer (FRP) composite reinforcement in concrete structures is an alternative system that is increasingly being used instead of steel reinforced concrete.
The first big advantage of the FRP's is the high tensile strength. Another important aspect is its durability. Its design life is the same as the design life of concrete, e.g. hundred years. Other important material properties are also high corrosion resistance, high chemical resistance, electrical insulation and non-magnetic property, easy machining, very low thermal conductivity. One of the critical requirements is the bond between the FRPs and concrete. The point is to provide the best possible adhesion surface. This can be improved by applying some scattering or roughening material (usually sandblasting) to the surface.

3. Test material samples (FRP) and their characteristics

Components of GFRP rebars:
- Glass Fiber
- Reactive resin matrix
- Additional materials

Key features:
- Exceptional tensile strength
- Low density
- Slight elongation at break
- Corrosion resistance

4. Experimental methods

1. Samples of 20 °C (a) and heat treatment in furnace 300 °C (b)

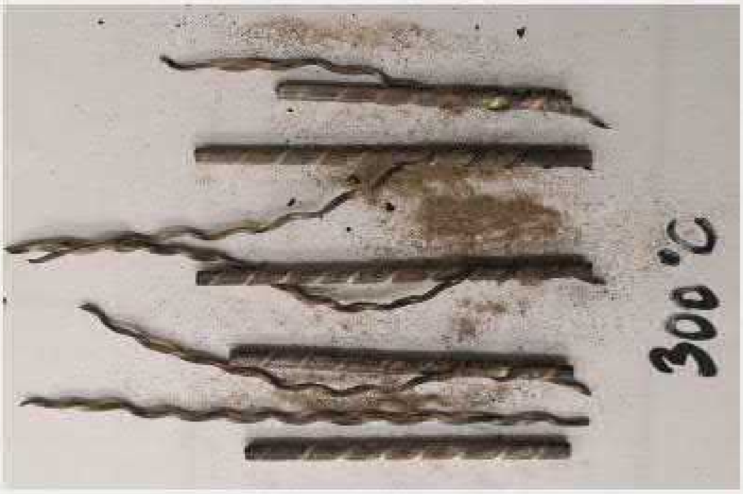
a)  b) 

2. Scanning electron microscopic observations: to study the morphology of the samples, images were obtained by a Phenom XL scanning electron microscope (SEM) .

3. Thermoanalytical method: the thermal behaviour of the studied materials were followed by thermoanalytical methods (TG/DTG/DTA) using Derivatograph-Q 1500 D.

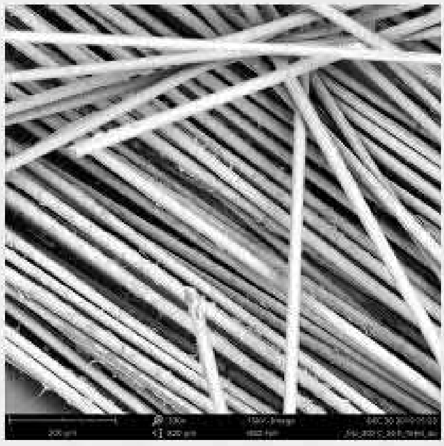
5.1 Test results – Macroscopic observation

After heat treatment in oxidative (air) atmosphere in furnace, 300 °C



5.2 Test Results – SEM observations

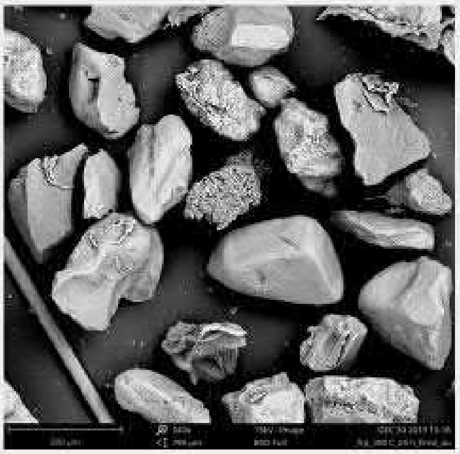
300 °C



Structure of GFRP rebar at 20 °C

Structure of GFRP rebar after 300 °C

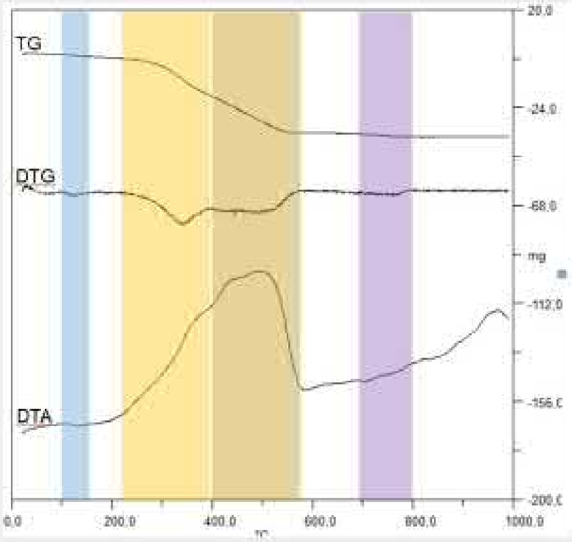
5.2 Test Results – SEM observations



Burnt sand grains after 300 °C

Released glass fibres after 300 °C

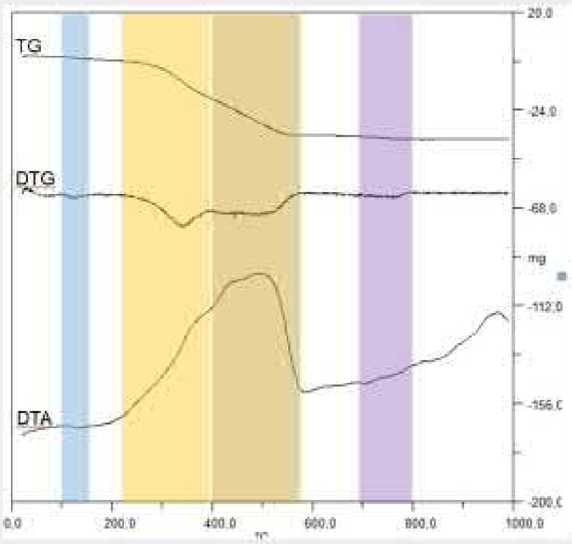
5.3 Test results – Thermoanalytical tests



Heat reactions with weight loss:

1. 100-150 °C: evaporation of physically bound water, and probably Tg (glass transition temperature) of resin ,
2. 220-400 °C: thermal decomposition (or pyrolysis if the test is carried out in an inert atmosphere),
3. 400-580 °C: Combustion - the most intense exothermic (heat generating) reaction during the test,
4. 700-800 °C: thermal decomposition of small amount of $CaCO_3$.

5.3 Test results – Thermoanalytical tests



Thermal reactions without weight loss:

5. at 573 °C the small endothermic peak of α-quartz (SiO_2) is not visible on the DTA curve (structural transformation to β-quartz),

6. 880-980 °C: the DTA peak indicates some endothermic reaction, possibly melting of glass + other residues or formation of any new phase.

6. Conclusion

In case of a fire obtained in oxidative (air) atmosphere, above 200-220 °C, the resin no longer works together with the glass fibre bundle

- after the resin has burned out from the composite, the tensile strength of the FRP is only provided by the loose glass fiber bundle;
- this reduced tensile strength can be exploited until the glass melts.

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Evaluation of BIM-based workflows in fire safety engineering
József Hesz1, Gergő Érces1, Balázs Nagy2
1University of Public Service
2Budapest University of Technology and Economics
VÉDELEM ONLINE


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Contents of the presentation

- Introduction
- Methodology, presenting BIM-based
  - analysis of building constructions for fire loads
  - fire and smoke propagation and evacuation simulation
  - integrated smart monitoring systems for fire alarm
  - fire prevention solutions
- Result and discussion
- Conclusion
- References

Abstract

In our research, we evaluated the possible BIM-based individual applications based on scientific literature and composed a workflow of a construction project that is organizing the use of engineering design and management involving BIM.

Our research goal is to facilitate the interconnection of BIM engineering applications and fire protection.

Introduction

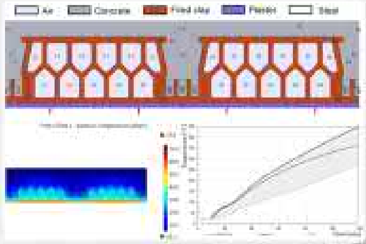
- Building information modelling and management (BIM)
- BIM can be used to provide or store information related to fire safety
- Based on and involving BIM models, many fire safety related tasks can be performed. Its usability depends on the BIM models level of development (LOD)
- BIM can be deployed in processes: design, simulation, optimization, evaluation, compliance check, trainings, alarm and rescue tasks

Methodology

- Review fire safety engineering applications and methodologies regarding desing and management
  -> 20 paper selected
- Evaluation of BIM-based possible workflows using fire safety engineering, design and management tools
- Compose a workflow for the whole building life-cycle regarding fire safety engineering and rescue management
  -> workflow created as a result

BIM-based analysis of building construction for fire loads

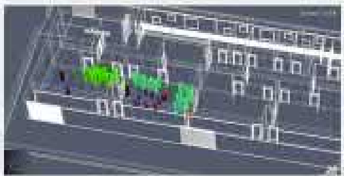
- Analysis of building construction for fire loads can be performed using BIM models of building constructions
- Simulations can precede or supplement experimental data on building construction's fire resistance
- Fire resistance perfomance can be stored in the model (e.g. IFC) and compliance check could be performed by authorities



FEA based on BIM object of a ceramic slab

BIM-based fire and smoke propagation and evacuation sim.

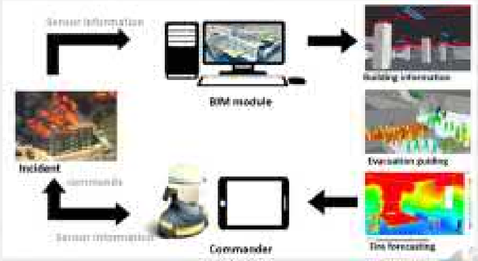
- Using the BIM model, fire dynamic simulations (FDS) showing fire and smoke propagation and evacuation simulations showing human egress can be performed
- FDS can support and optimize the design of buildings and its constructions not only evaluate it
- Evacuation during fire depends on the fire and smoke propagation



Evacuation simulation for special use

BIM-based integrated smart monitoring systems for fire alarm

- Application of wireless sensor networks in fire safety and rescue management
- Fireground location based on sensor and building model
- BIM-based integrated system for fire emergency management



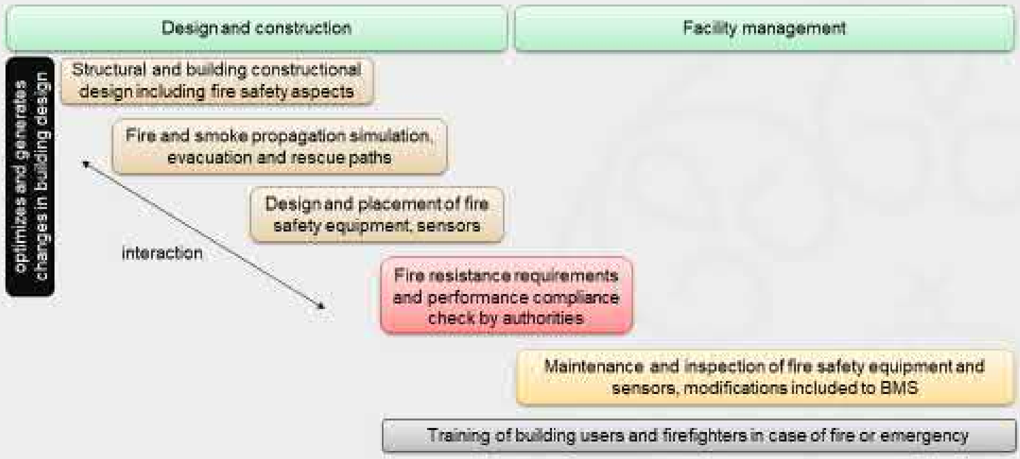
Future use of BIM during incident management [3]

BIM-based fire prevention solutions

- BIM-based maintenance and inspection of fire safety equipment using AR and as-built BIM-model
- VR and AR-based fire safety training, evacuation and rescue pathfinding
- AR based real-time route navigation


Fire training using VR HMD [4]

Result and discussion



Conclusion

- BIM can be used throughout the whole lifecycle of a building project
- All fire safety engineering applications can optimize and generate changes in the building design
- Instead of individual assesments, we have to think in a complex system, where each process in the workflow could interact with each other using the same dynamically developing BIM model

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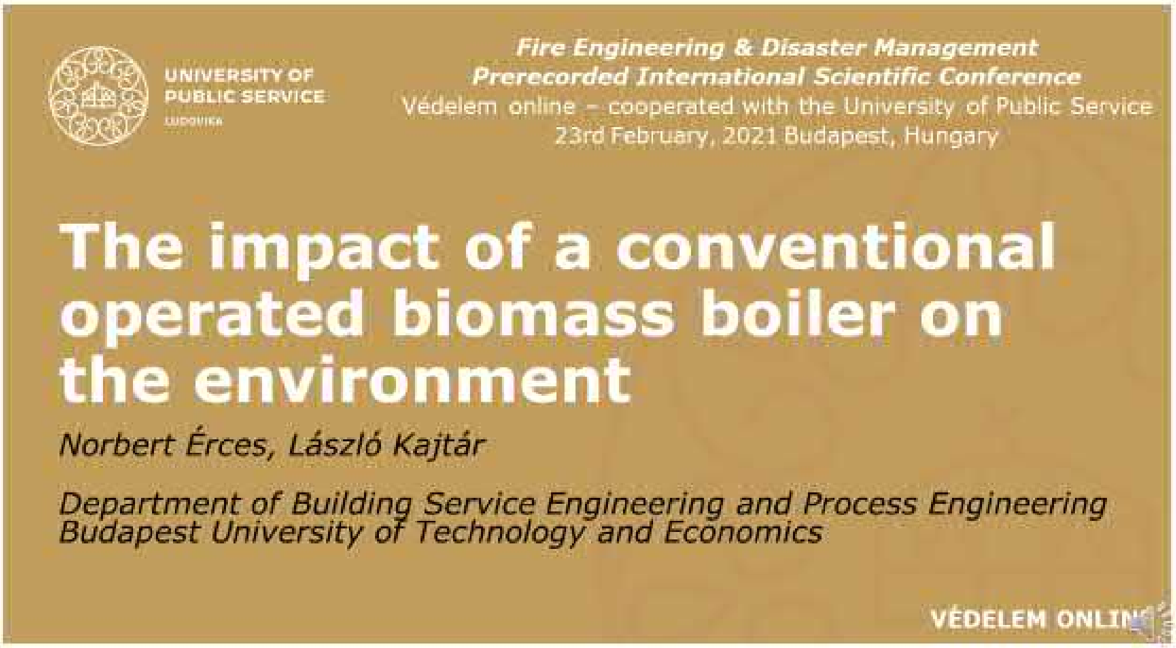
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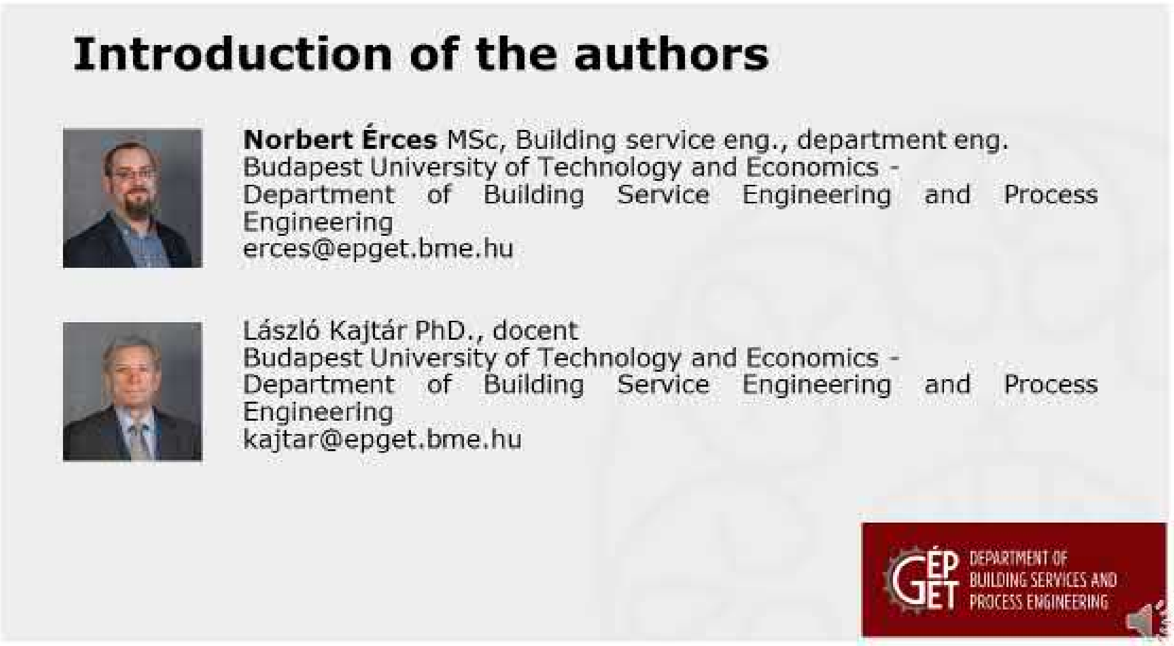
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
The impact of a conventional operated biomass boiler on the environment
Norbert Érces, László Kajtár
Department of Building Service Engineering and Process Engineering
Budapest University of Technology and Economics
VÉDELEM ONLINE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GÉP ÉT
DEPARTMENT OF BUILDING SERVICES AND PROCESS ENGINEERING

Content

Abstract

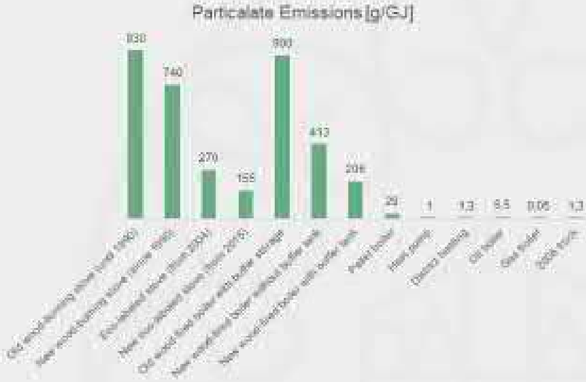
In the case of solid-fuel installations, there is still a large number of traditional wood-fired equipment operating without proper combustion control. Depending on the economic and infrastructural development, these devices are one of the main sources of air pollution. Of course, the emission of pollutants depends primarily on the quality of the fuel or on the behavior of the user, but can also be significantly reduced with the proper boiler setting.

In our study, we tested the operation of a conventional, manual-feed, wood-fired boiler for household use, depending on the opening angle of the combustion air control door. Studies have shown that a constantly changing position of the draft control door has an adverse effect on carbon monoxide emissions as well as the energy produced. In the case of a constant draft door setting, the preset values that can be considered ideal for energy yield and CO emissions were determined for the two fuel types.

Place of biomass combustion in energy supply

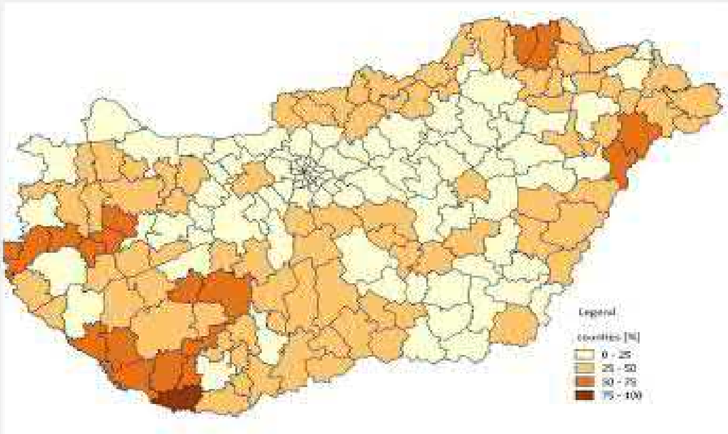
Fuel	Number of dwellings (thousand)	Proportion of dwellings as a % of total inhabited dwellings
Gas	2388	61.96
Coal	113	2.93
Electricity	76	1.97
Oil fuel	1	0.03
Wood	***1470***	***38.14***
Solar energy	5	0.13
Geothermal energy	3	0.08
Pellets	2	0.05
Other renewable	3	0.08
Other fuel	4	0.10
All inhabited dwellings	3854	100.00

Use of fuel in inhabited dwellings [KSH, 2011]



Particulate emissions of different heating methods in Denmark

Place of biomass combustion in energy supply



Proportion of households using only solid fuel in each district

Operational characteristics

- Uncertain regulatory
- Sizing of buffer storage
- Uncertain fuel quality
- Lower efficiency compared to the gas boilers
- Fuel storage space requirements
- Air pollution

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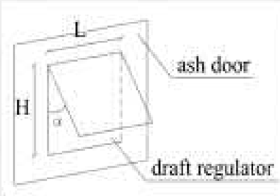
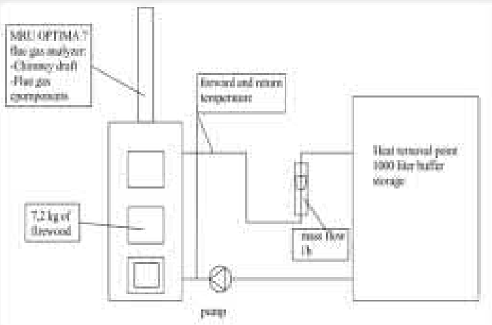
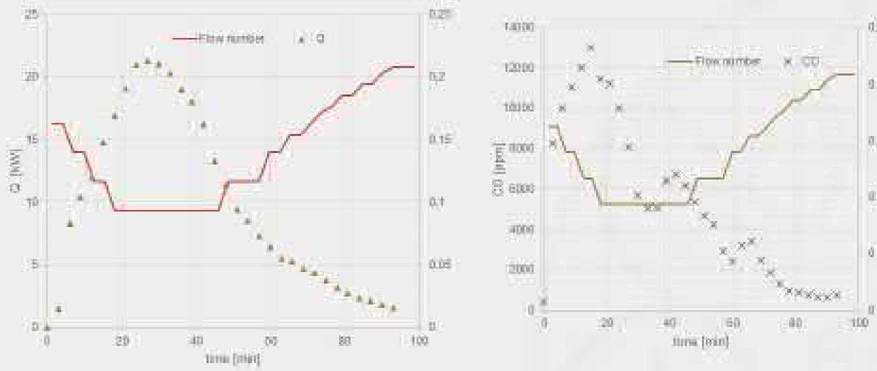


Measurement procedure



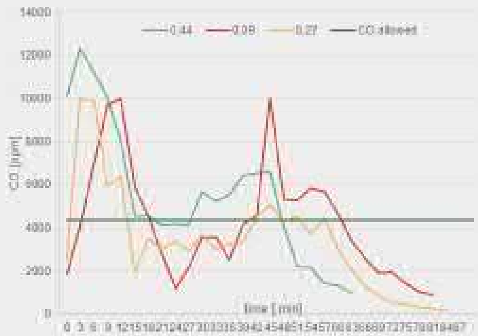
Fuel	Mass	Primary air control door operation	Notation
Wood	7.2 kg	With draft controller	1st case
		C_{case}= 0,093 C_{case}= 0,275 C_{case}= 0,440	2nd case
Briquette	7 kg	C_{case}= 0,093 C_{case}= 0,275 C_{case}= 0,440	3rd case

Results

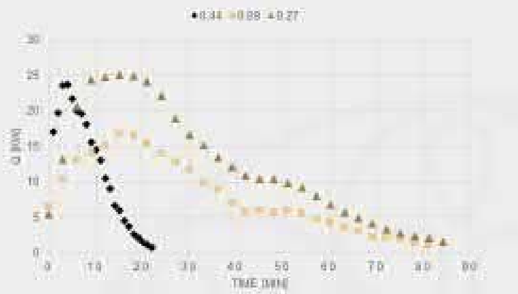


Development of Q and CO at different flow rates over the whole period

Results



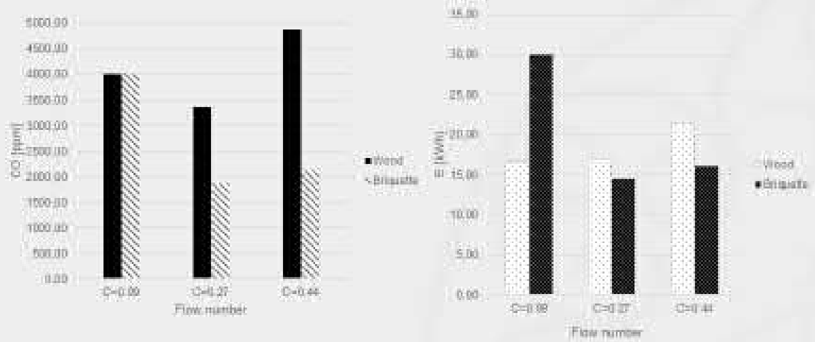
CO emission evolution for each flow rate



Evolution of yielded power at different constant flow rates

Operation	CO_{avg}	Average difference CO
	[ppm]	[ppm]
Draft ctrl.	5973.03	1606.96
C=0.09	4017.14	-349.93
C=0.27	3368.54	-997.53
C=0.44	4879.00	512.93

Results



Average CO emissions and energy yields for different fuels

Conclusions

- The automatic draft regulator has an unfavorable effect on the carbon monoxide emission values of the device and on the recoverable energy yield, therefore it cannot be considered as an optimal solution from the point of view of environmental protection and energy consumption.
- We have found that, with the exception of one case, the CO emission limits specified in the relevant standard for a permanent draft control door can be met at a higher energy yield than in the case of continuous draft control.
- In the case of log burning, higher CO emissions were achieved with all tested presets than in the case of briquette burning. When burning briquettes, we get the highest energy yield with low flow rate and carbon monoxide emissions within the limit value.

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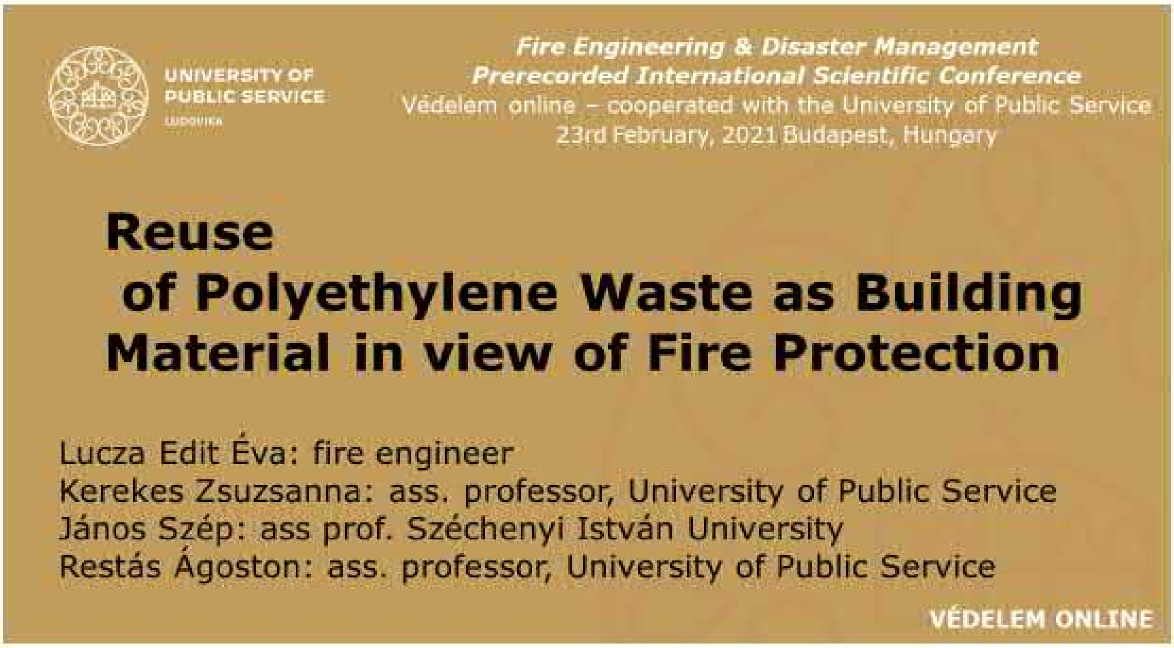
Edit Lucza – Zsuzsanna Kerekes – János Szép - Ágoston Restás:
Reuse of Polyethylene Waste as Building Material in view of Fire Protection



Structure:

1. Abstract
2. Introduction of the presentation
3. Insulating test material samples
4. Test method 1 /Behavior against radiant heat/
5. Test method 2 /Small flame vertical flame spread test/
6. Discussion, Conclusion

1. Abstract

In the course of our work, we examined different types of polymer tiles from a fire protection point of view. We investigated their behavior against radiant heat. In addition, we performed a small flame propagation test on them. The standard tests provide an opportunity to compare the data collected during the tests with other façade cladding currently used in construction practice, as well as with thermal insulation materials.
The aim of the tests is to get an answer to which fire protection classes the tiles we are currently examining can be classified and what kind of construction task they are suitable for performing according to the current regulations.

2. Introduction of the presentation

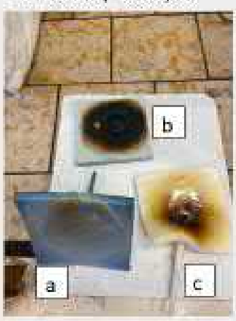
Nowadays, disposable soft drink bottles are a growing problem. They have already accumulated in some areas of the Earth to such an extent that they form mountains or islands. According to a study carried out by the European Parliament in 2015, 322 tonnes of plastic waste are generated in the European Union each year, and only 30% of this is recycled.

Several industries are trying to recycle the resulting plastic waste, but the numbers show that the amount of recycling should be significantly increased.

The fact is that, in order to protect our environment, we should reduce the use of plastics and ensure that they are recycled to a greater extent. We need to look for areas where we can use products from bottle recycling.

3. Insulating test material samples

The tested materials were prepared by the Polymer Technology Laboratory of the Széchenyi István University of Győr.



a. / Polietilén-tereftalát;

b. /Polietilén-tereftalát, foamed 4% with 10% flame retardant;

c. / Terluran GP35 ABS

d. / XE4106 black

4. Test method 1

Behavior against radiant heat

The behavior against radiant heat was performed in the Polymer Technology Laboratory of the Széchenyi István University in Győr, with a controllable heat source.

The device consists of two main parts, a heat source and a controller. The control unit consists of two further parts. The upper device collects and displays the data provided by the thermocouples and records and displays the measured characteristics using a computer program.

The lower unit controls the controlled heat source based on the measured data.

Behavior against radiant heat

The specimens are injection molded inserts made of plastic ground with an average size of 9.8 cm x 9.8 cm x 8 mm (+/- 1 mm deviation). At half the thickness of the specimen, a 2 mm diameter hole was formed for one of the digital thermocouples.
The duration of the study was 10 minutes in each case.
Initial and post-test weights were recorded during the study.

a

b

c

d

4.a Test results

A high degree of carbonization is observed on the surface of the sample. Tiny blisters formed on the surface, at the beginning of the blistering the temperature on the protected side decreased by 2 C.

When the sample reached a temperature of 154 C, strong smoke formation was observed. At an internal temperature of 173 C, surface deformation is observed, no loss of strength. 7 minutes after the start of the test, the heating on the protected side is greatly slowed down.

10 minutes after the start of the test, the temperature inside the sample is 200 C and on the protected side 60 C.

4.b Test results

No bubbling and smoke formation occurred in the first 2 minutes. After two minutes, a surface discoloration was observed, and then the surface material began to melt fibrously.

At 4 minutes 10 seconds, the surface of the sample melted and flowed away from the sample, at which time the internal temperature of the sample was 170 ° C. Minimal surface charring is observed. Almost barely perceptible smoke formation occurred.

10 minutes after the start of the test, the internal temperature of the sample is 200 ° C and the temperature of the protected side is 76 ° C.

4.c Test results

A digital thermocouple placed in the middle of the sample (3 mm deep from the side exposed to radiant heat) reached a temperature of 50 C in 3:11 minutes. At 5 minutes 10 seconds, the sample became plastic during the test, but there was no dripping. It began to "drain" from the sample holder in its full mass, so the study had to be interrupted. There was no visible smoke formation. Charring is observed on the surface of the sample.

4.d Test results

During the test, the specimen retained its strength, its surface split at the center of the heat effect. No visible smoking was observed, but a small amount of unpleasant odor was produced by the heat, about 50 cm from the sample. There was minimal, almost negligible weight loss. The sample did not deform other than surface blistering, retaining its rigidity. The sample was exposed to radiant heat for 10 min, during which time the digital thermocouple placed in the center of the sample did not reach a temperature of 50 ° C.

5. Test method 2

Small flame vertical flame spread test

During the test, the flame tongue was 4-5 cm in size and made an angle of approximately 45 degrees with the specimen.

The specimen was exposed to the flame at a height of 2 cm from the bottom of the specimen.

The aim of the test was to determine that the flame reaches a height of 15 cm from the bottom of the sample during the 30 second exposure time.

5.a Test results

A large amount of charring is observed, but the flame spread is up to 92mm measured from the bottom of the sample. There was no burning drip.

No further combustion occurred after removal of the ignition source. Minor surface changes in the vicinity of the flame tongue contact surface.

5.b Test results

Charcoal is minimal and burns are observed. No further combustion is observed after removal of the ignition source. Small amounts of material dripping are observed, but the dripping drops do not burn.

The material cannot be ignited, it only glows minimally where the flame tip has hit it directly. Minimal surface damage is observed at the surface in direct contact with the flame tip.

5.c Test results

A high degree of carbonization of the sample is observed. Burning pieces detached from the sample with rapid heat and flame evolution.

The detached pieces continued to burn. It was very difficult to extinguish with water.

5.d Test results

The sample did not show a significant change during the exposure time due to the ignition source.

After removing the ignition source, the surface in contact with the flame remained glowing and was already burning with flame 35 seconds after removing the ignition source. Rapid flame evolution was then observed and burning pieces began to detach from the sample.

The detached pieces continued to burn. It could only be quenched with significant amounts of water.

6. Discussion, Conclusion

Based on the tests performed so far, it can be said that the Terluran GP35 ABS and XE4106 black samples showed self-sustaining combustion under the influence of flame, therefore they are not suitable for covering facades in the tested form.

Polyethylene terephthalate, in contrast to Polyethylene terephthalate, foamed 4% with 10% flame retardant, in contrast, performed well in the studies.

These two materials need to be further tested in order to determine exactly how and in what form they can be used as facade cladding or possibly in other ways.

Naturally-Occurring Bromophenol to Develop Fire Retardant Gluten Bioplastics

By

Oisik Das (Presenter)

Agoston Restas

Michael Försth

Gabriel Sas

Mikael Hedenqvist

Correspondence: Oisik Das and Mikael Hedenqvist

"International Prerecorded Scientific Conference on Fire Engineering and Disaster Management" in Budapest, Hungary

Data obtained from a study (*Das, O., Kim, N.K., Hedenqvist, M.S., Bhattacharyya, D., Johansson, E., Xu, Q. and Holder, S., 2020. Naturally-occurring bromophenol to develop fire retardant gluten biopolymers. Journal of Cleaner Production, 243, p.118552.*) conducted by Oisik Das et al. at KTH Royal Institute of Technology under the supervision of Prof. Mikael S Hedenqvist

What is wheat gluten and why attaining fire retardancy is important?

- The main protein of wheat
- Made by removing starch
- Consists of gliadin and glutenin
- Co-product of cereal processing industry in the Nordic countries
- Can be a potential bioplastic
- Application areas: furniture, electrical casings, packaging, etc.
- Susceptible to burning: health hazard and property loss
- Must be treated with fire retardants (FRs)

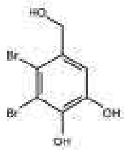
A burning gluten sample

Lanosol: A Boon or A Bane?

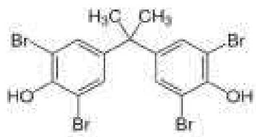
An electron microscopy image of lanosol

- **Obtained from red marine algae (e.g. *Rhodomela confervoides*)**
- **2,3-dibromo-4,5-dihydroxybenzyl alcohol**
- **Effective anti-microbial agent and use in textiles is already reported**
- **Hypothesis: owing to the presence of bromine in the molecular structure, lanosol could suppress flame growth akin to halogenated FRs**
- **Previous studies have indicated that only 4 wt% of lanosol is a suitable amount in gluten polymers**
- **If 4 wt% of lanosol could have a similar fire retarding effect to other brominated FRs and mineral/phosphorous-based FRs should it be used in polymeric systems to maximise the amount of sustainable biopolymers?**

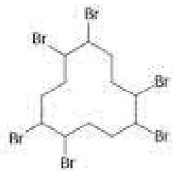
FRs used in the study



a. Lano= Lanosol



b. TBBP= Tetrabromobisphenol A



c. HBCD= Hexabromocyclododecane

The different FRs were added to gluten, which was then processed using compression moulding and tested for fire and mechanical properties.

Manufacturing: Compression moulding

Fire tests: Cone calorimeter, UL 94 and MCC

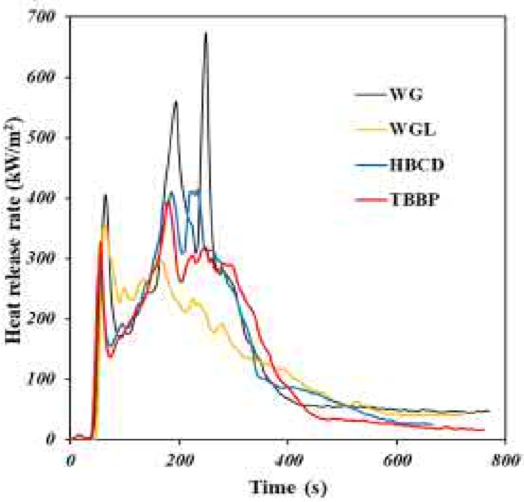
Mechanical tests: Instron

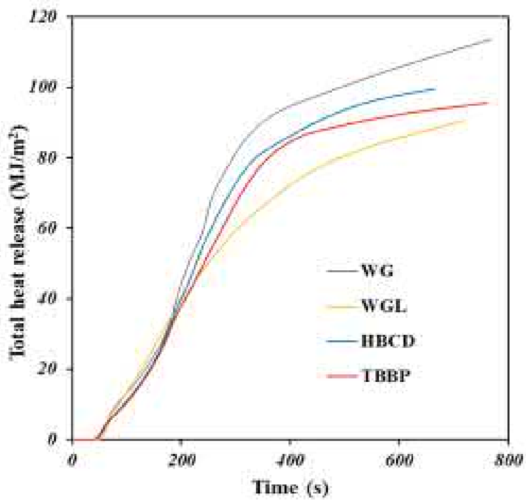
The Fire Results

Specimen	Cone calorimeter results						
	TTI (s)	PHRR (kW/m^2)	TPHRR (s)	THR (MJ/m^2)	FPI (m^2s/kW)	CO (kg/kg)	CO_2 (kg/kg)
WG	28.5 ± 0.7	703.4 ± 48.7	207.5 ± 60.1	103.7 ± 2.3	0.041	0.031 ± 0.002	1.28 ± 0.04
WGL	31 ± 2.8	353.3 ± 3.4	115 ± 70.7	89.6 ± 7.4	0.088	0.048 ± 0.01	1.13 ± 0.04
HBCD	26 ± 2	408.4 ± 13.1	196.7 ± 34	94.8 ± 1.5	0.064	0.076 ± 0.003	1.1
TBBP	27.7 ± 3.1	396.3 ± 11	176.7 ± 2.9	89.8 ± 1.3	0.07	0.059 ± 0.008	1.1 ± 0.02

- **All the FRs reduced PHRR but WGL had the lowest PHRR.**
- **Fire performance index, FPI (i.e. the ratio of time to ignition, TTI to PHRR) indicates the level of fire hazard. A higher FPI specifies a lower level of fire hazard.**
- **Addition of all the FRs increased the FPI of the samples compared to that of the neat WG.**
- **WGL had the highest FPI due to its long TTI and low PHRR.**

The Fire Results

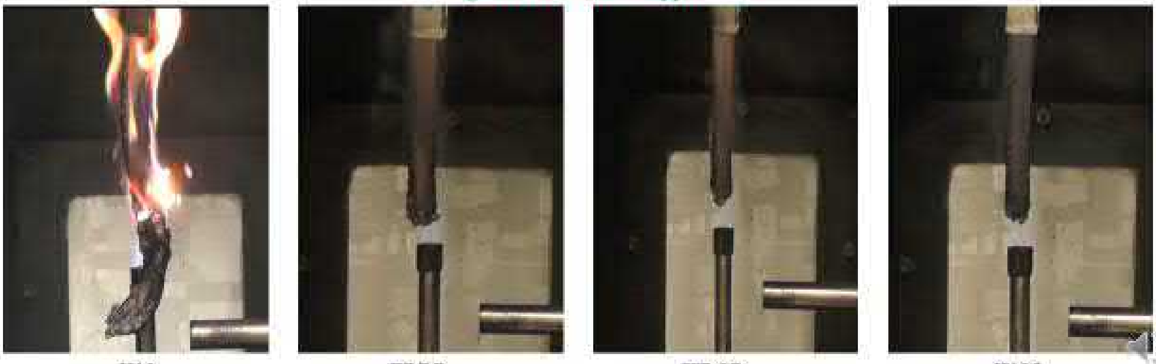




The Fire Results

Samples	UL 94 Rating
WG	No Rating (2nd Application)
TBBP	V0
HBCD	V0
WGL	V0

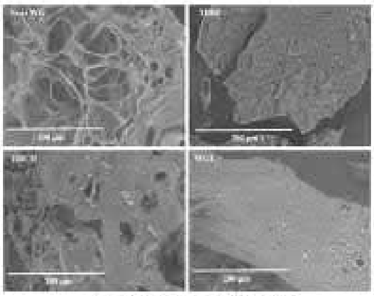
Images after 2nd flame application



WG TBBP HBCD WGL

Gluten with Lanosol Attaining V0 rating

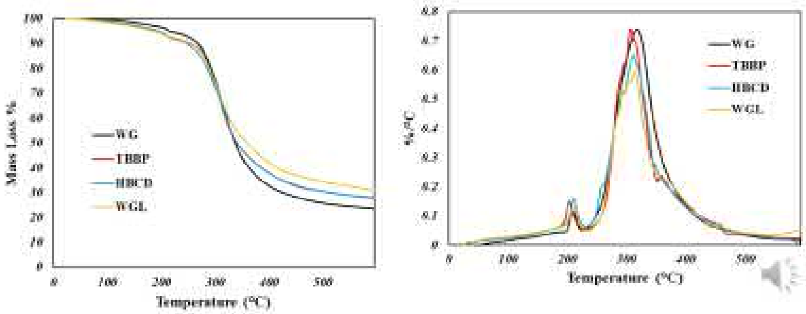
Char Analysis and Thermal Properties



Char microstructure seen through SEM

From both char microstructure and TGA analysis, it can be seen that lanosol performed the best amongst the other FRs and neat gluten!

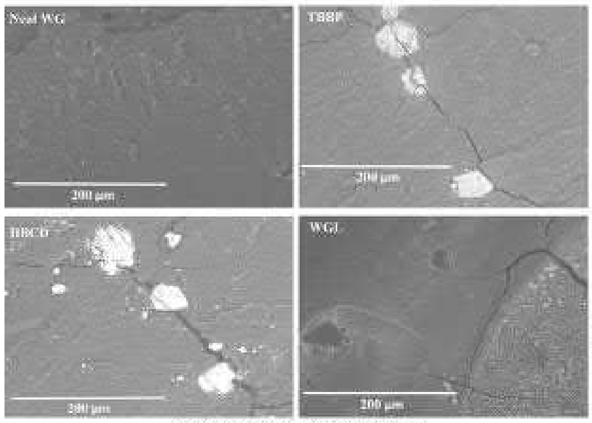
TGA analysis



Mechanical Properties

Samples	Tensile strength (MPa)	Tensile modulus (GPa)	Tensile strain at break (%)
WG	29.2 ± 2.1	1.25 ± 0.06	3.9 ± 2.3
TBBP	11.6 ± 0.9	3.9 ± 0.0	0.3 ± 0.0
HBCD	18.0 ± 3.8	3.9 ± 0.0	0.4 ± 0.1
WGL	11.3 ± 2.6	3.7 ± 0.3	0.3 ± 0.0

Tensile properties



SEM of tensile fractured surfaces

- **Neat WG has a tensile strength that is almost equal to commercial polypropylene.**
- **The addition of all the FRs has compromised the tensile strength and ductility of the WG polymer but the modulus increased.**
- **The rigid FR particulates, being stiffer than the polymer itself, resulted in higher stiffness of WGL, TBBP and HBCD samples.**
- **The crack formation in the FR added samples caused the ductility to reduce.**
- *WG polymer containing lanosol should have targeted applications where the stiffness of the material is more important than its strength.*

Conclusions

- **Lanosol is a potent naturally-occuring FR in gluten bioplastics**
- **Lanosol performs better than other conventional brominated FRs**
- **Lanosol reduces tensile strength but increases modulus**
- **Lanosol should be used in gluten for targeted applications**

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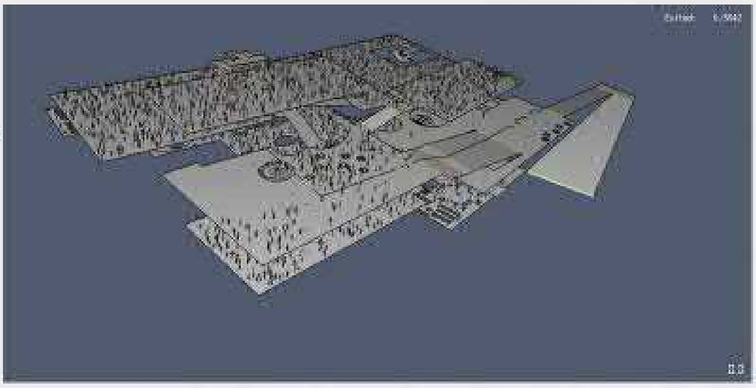
Judit Rauscher Veresné: *Evacuation scenarios and repeated runs for evacuation simulations*

What is it about today?

- evacuation simulations – why is it good?
- evacuation scenarios – why to make? how to make?
- repeated runs – why it is needed?
- discussion

Evacuation simulations

- a performance based tool
- for examination of evacuation process!
- a rapidly evolving field of fire protection
- new ISO standard for validation and verification of programs
- 72 programs in the world



internationally 35% use Pathfinder

- a model is always a simplification of realty
- it is very important what we simplify and how we interpret the results

Evacuation scenarios

Evacuation is a special field because it depends not only on engineering tools but also heavily on human factors.

That's why no 2 evacuation processes are the same!
It can only be estimated on the basis of probabilities...

mode of use and the evacuation strategies

\+

a scenario is defined by

- a geometry
- number and an initial distribution of persons
- the statistical composition of the population
- pre-movement time of persons
- fire scenario

Mode of use

- several different uses can be anywhere
- try to form characteristic groups where the occupants number and evacuation conditions are similar

examples

- sport building ↔ concerts
- school gym ↔ school year opener
- meeting points → many kinds of events

Initial place and number

- the mode of use gives the number of occupants
- the location is constantly changing parameter

choose tipical scenarios for initial place, maybe extreme values …

design program or fire safety guideline

examples

everybody inside ↔ everybody at buffets

Geometry

OTSZ: „every evacuation route is safe and occupants use them"

= this is the ‚classic' scenario

we only restrict routes if smoke appears on them (based on a fire- and smokespread simulation)

other ways in regulations:

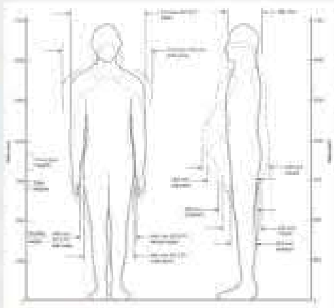
- USA: 2/3 of occupants use the main exit
- UK: if there is more exits or stairwells, the biggest is out of order
- EU: fire scenarios near the exits + the biggest exit is out of order

There is currently no requirement in Hungary!

Characteristics of persons

- fix parameters or statistical datas?
  all the same ↔ diversity

36% use the program defaults!?



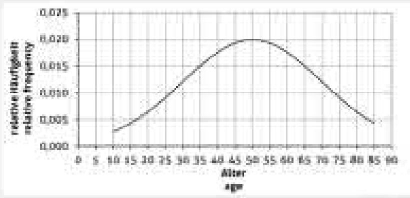
- given usually by gender and/or age ↔ if known!!!

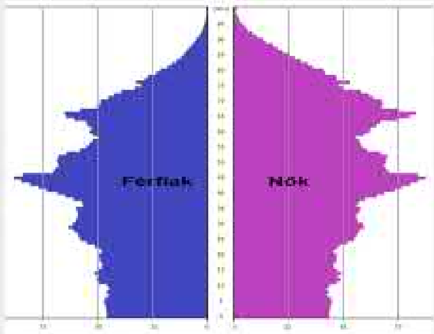
examples

may there differences?

Characteristics of persons

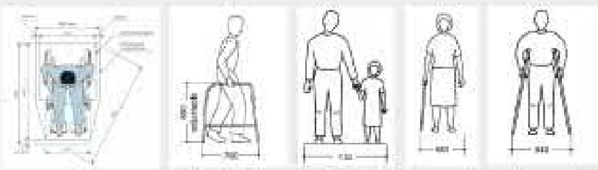
- in Germany: mean 50 years (10-85, SD 20)

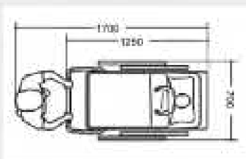




- disabled people
- assisted movement

exact Hungarian datas needed !?

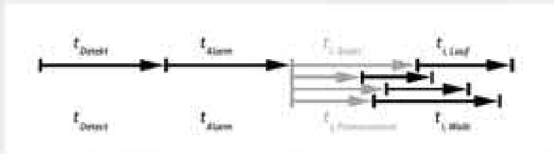




@KSH – 2020
estimated age range

Pre-movement time

- for everybody different in a real situation



- more and more data (from cctv systems…)
- if there is no data → estimated time based on people and building characteristics, between 0,5 and >30 min

PEOPLE		BUILDING		
asleep	familiar	automatic fire detection system	simple, open floors	good fire protection managment
or	or	or	or	or
awake	unfamiliar	no fire detection system	large, complex floor plan	complies with minimum standards

Repeated runs

- statistical values → repeated runs needed
  - Germany: 10 times or more
  - international research: predetermined or „as I used to” or „the SD should fall below a given value”

There is currently no requirement in Hungary!

my opinion: SD may be between 0-30 s or <10% of RSET ?

- statistical analysis → minimum, maximum, average, standard deviation

wich is the significant? average or max?

example

if 20 runs, average 100 s, SD 9 s
than confidence interval (95%) is between 96 – 104 s

Discussion

- usually more scenarios
- due:
  - more type of usage
  - use different occupants
  - use more pre-movement time
  - try more geometric options
  - try more initial place options
- if statistical values → repeated runs needed, but more accurate modelling method
- statistical analysis → minimum, maximum, average, standard deviation, confidence interval estimation …

→ the significant will be the confidence interval estimation (95%)

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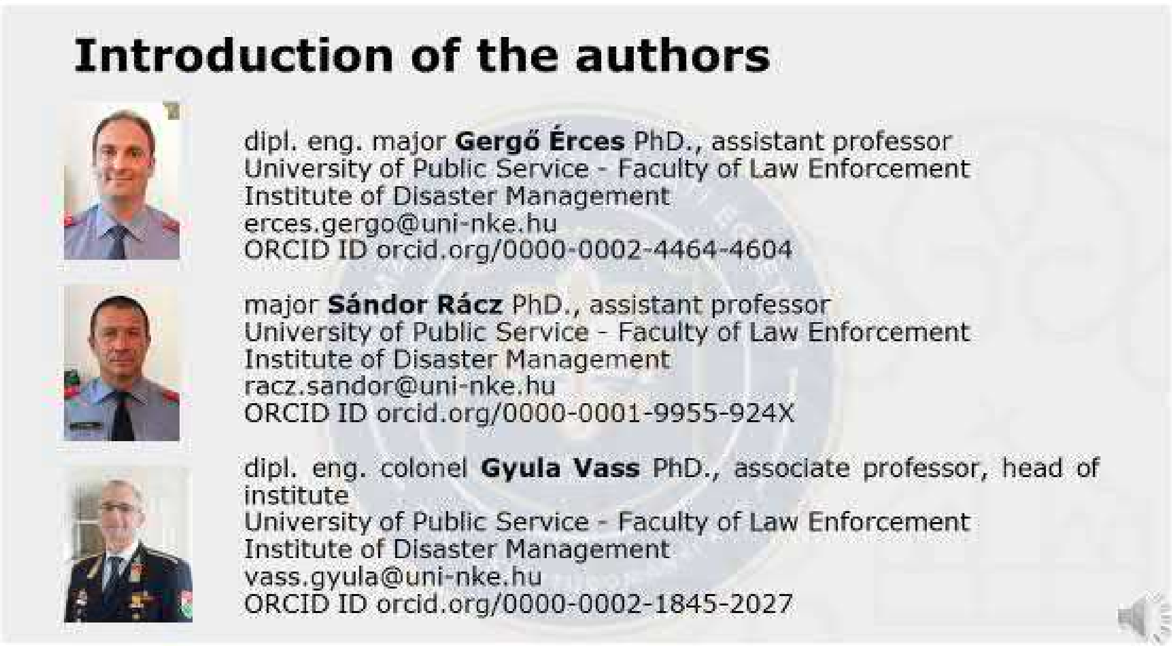
UNIVERSITY OF
PUBLIC SERVICE
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Fire protection in smart cities
Gergő Érces – Sándor Rácz – Gyula Vass
University of Public Service
Budapest, Hungary
VÉDELEM ONLI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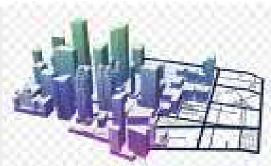
Content of the presentation

- Introduction - Abstract
- Objectives, methods
- About smart cities
- Smart city subsystems
- Monitoring topics in smart city subsystems
- Safety in smart cities
- Fire protection in smart cities
- Conclusion
- Results
- References

Introduction - Abstract



Nowadays, the principle of smart urban development is already a priority in modern urban planning and development. In line with international trends, nations almost without exception have a smart city development strategy.

Although the European Union does not have comprehensive smart city regulation, the area is receiving special attention. The big framework programs of the EU typically are: energy efficiency, resource management, economic competitiveness, innovation and communities involved in the renewal of governance. Within the framework of the European Commission's JPI joint research programming initiative, Urban Europe has launched research and development cooperation. The program addresses European urban development in five thematic areas: urban economies, prosperity and finance, resilient environment, access and connectivity, governance and participation.

The evaluation system supporting the smart strategies of Hungarian settlements defines complex indicators according to thematic areas in six subsystems: smart mobility, smart environment, smart people, smart living, smart governance, smart economy. One of the monitoring topic in the smart living subsystem is safety. In this monitoring topic we research how the future of fire protection - one of the cornerstones of safety – in smart cities will develop.

Goals, methods

Goals:

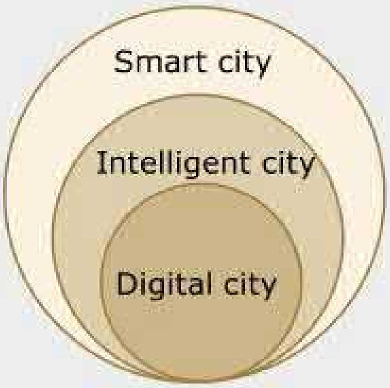
- Develope a smart fire protection network
- Evolve a fire safety big data base

Methods:

- Investigate the possibilities in smart city strategy
- Research the monitoring topic in smart living subsystem in terms of view fire safety

About smart cities

No generally accepted definition:

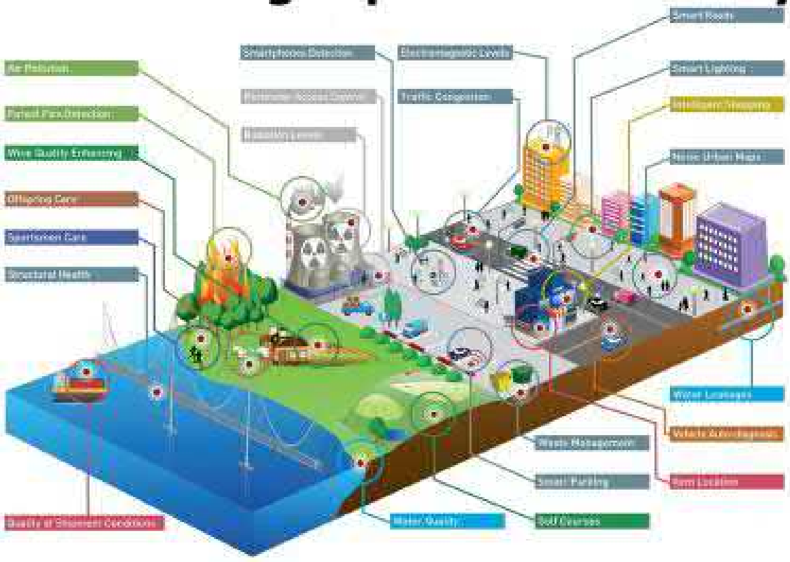


Smart city method is one of the methodologies of settlement development

Smart city subsystems

- smart mobility
- smart environment
- smart people
- smart living
- smart governance
- smart economy

Monitoring topics in smart city subsystems



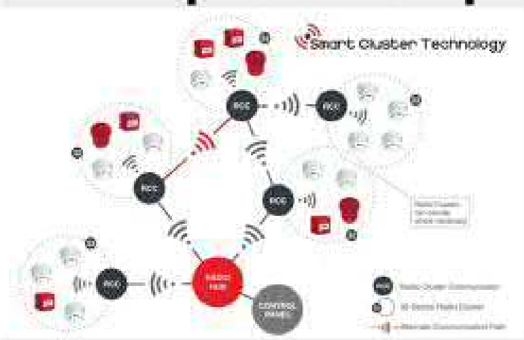
- Education
- Environment
- Climate
- Governance
- Economy
- Safety
- Traffic
- Etc.

Safety in smart cities

The main monitoring topics in the field of smart living:

- Housing
- Social situation
- Health
- Lifestyle
- Safety

Fire protection principle in smart cities



- Fire alarm systems
- Fire protection network
- Fire protection big data

- Smart fire prevention
- Smart fire protection systems
- Smart fire interventions

Conclusion

Available options:

Smart fire alarm systems which evolve a network concentrating on disaster management

Next step:

Integration of city-level fire protection systems to develope a fire protection network

Results

- We identified the location of fire protection development in the field of safety one of the subsystem of smart city
- We determined how to integrate the base of smart fire protection into the available system of disaster management

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Fire Engineering & Disaster Management
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How different kinds of built-in fire prevention equipment work together
Katalin Nagy - LUDOR Kft.
VÉDELEM ONLINE


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Abstract

In increasingly complex buildings planned heat and smoke exhaust is critical to ensure safe escape routes. The cooperation of various types of fire prevention equipment was examined in full-scale tests. Meanwhile, the developments in measurement methods allowed for more detailed investigations. Full-scale tests by Dr. Covelli et al. demonstrated that targeted smoke extraction is essential in places both protected and unprotected by sprinklers, However, both functions should be considered when creating a system. A series of French studies, concluded in 2020, in addition to further reaffirming the current principles in regulation, presented the 10 golden rules of natural smoke extraction.

Keywords:

seamless cooperation of fire prevention equipment, full-scale fire tests, heat and smoke extraction, effective life protection, sprinklers

Main stages of developments

- 2014 – OTSZ Protection goals and priorities – engineering approach
- Built-in fire prevention equipment – Investigation of cooperation and efficiency
- Full-scale test - the first relevant fire experiment, Gant 1998
- Measurement methods - developments in tools and methods, Covelli
- Developments in IT
- Complex studies 2018 - 2020, Osmose FFMI
- Efficiency - Summary Statutes

Built-in equipment and protection goals

Life protection

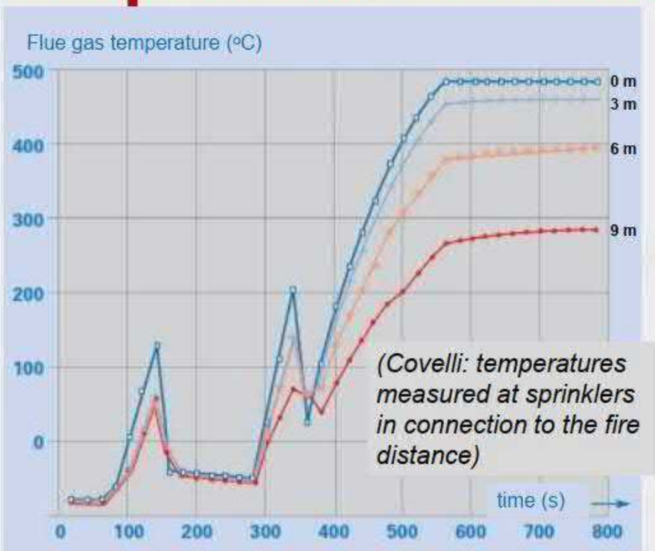
- quick alarm
- providing the conditions of escape and rescue – a layer of air with low-smoke content

Value protection

- decreasing the time needed for fire detection
- decreasing the time needed to start extinguishing the fire
- providing the conditions needed for firefighter deployment
- reduction of heat and smoke load

Gant: 5 fire tests 1998

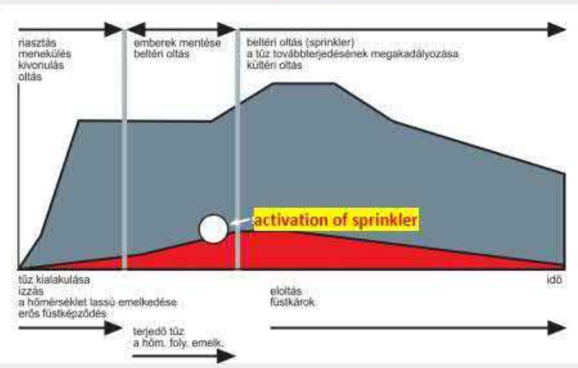
Cooperation of NSHEV and sprinklers

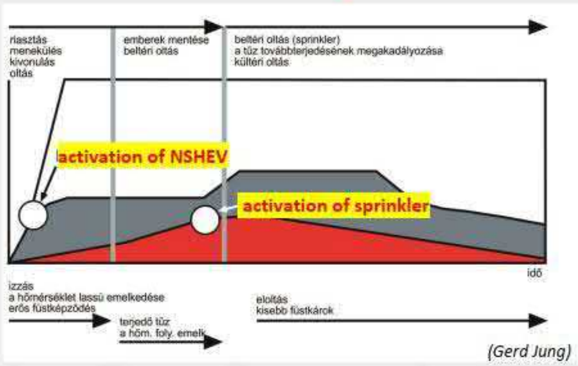


Sprinkler placement compared to the fire	With NSHEV	Without NSHEV
Center	139 sec	140 sec
3 meters	334 sec	344 sec
3 – 6 meters	367 sec	405 sec
6 – 9 meters	420 sec	437 sec

No significant difference,
but sprinkler release is faster when used in the presence of NSHEV

Detector, sprinkler and NSHEV cooperation





Only sprinklers

Fire spreads, temperature decreases

Intense smoke development, flue gases suppressed by steam - escape route?

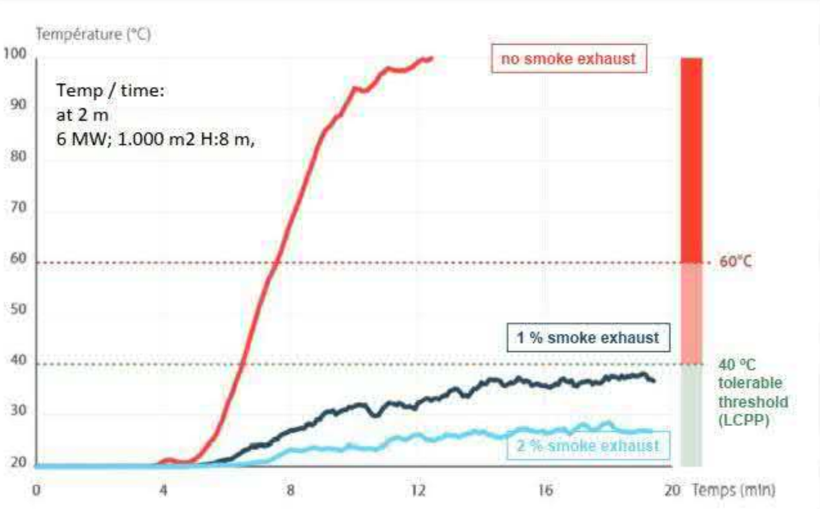
Detector + spinkler + NSHEV

1.fire detection 2. automated smoke exhaust

3. activation of sprinklers

Thermal load reduced drastically = life and property protection

Complex tests 2018 – 2020



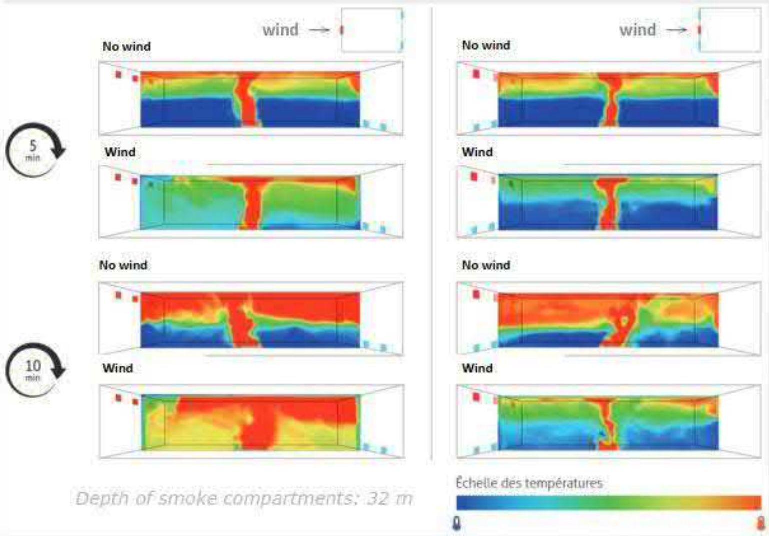
tolerable temperature threshold

and

effective opening surface

(OSMOSE 2020)

Complex tests 2018 – 2020



effect of the wind on the NHSEV

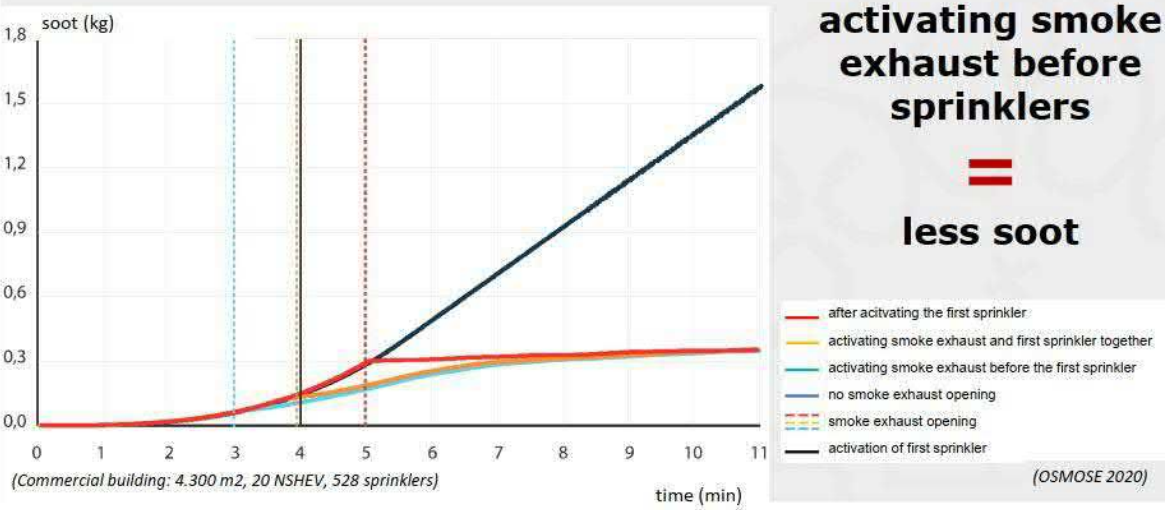
on the facade -

air inlets and smoke vents on the same facade

better

(OSMOSE 2020)

Complex tests 2018 – 2020



activating smoke exhaust before sprinklers

=

less soot

(OSMOSE 2020)

10 golden rules of natural smoke extraction

Natural smoke exhaust is:

- Effective regardless of the number and size of the vents, if the effective opening surface is adequate.
- Effective with both facade and roof smoke extraction.
- *More efficient if*
  - ➢ using smaller smoke compartments (more prevalent thermal drafts)
  - ➢ increasing the size of the effective opening surface
  - ➢ increasing the size of the air inlet surface
  - ➢ the air inlet surfaces are located as close to the ground as possible
  - ➢ in a building exposed to wind, the facade smoke and air inlet vents are located on the same facade.
- NSHEV and spinkler systems complement each other if the smoke extraction vents are opened before the activation of the sprinklers.
- *Natural smoke extraction and sprinkler systems are more effective if*
  - ➢ the effective opening surface is distributed over several smoke extraction vents,
  - ➢ the sprinkler head is located under the smoke extraction device.

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Péter Tóth: *New Hungarian standard for testing facade fire propagation*

Contents of the presentation

- Phenomenon of fire spreading on facades
- Testing methods in Europe
- Hungarian method for testing fire propagation on facades
- The new MSZ 14800-6:2020
- Conclusion and Future research

References

Abstract

There is a continuous change in building technologies and in building materials. The risk of serious facade fires has been increased due to extensive use of combustible materials on facades during the last 20 years.

The existing national testing and classification methods shall be reviewed and modified regularly in order to follow these changes.

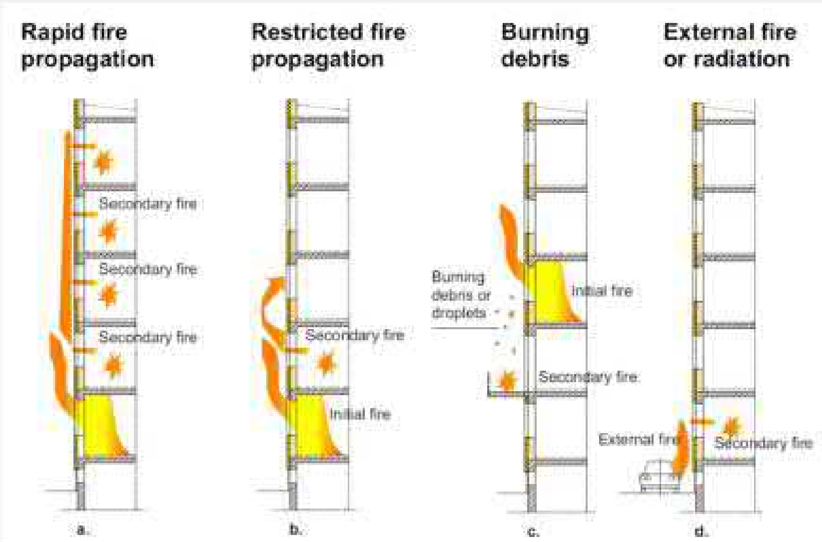
This presentation briefly describing the alterations and the new features of the Hungarian testing standard MSZ 14800-6:2020.

Introduction

- The fire propagation on facades is in the focus of the international research activities.
- The tragedy of the Grenfell Tower (2017) catalised the national and European efforts in this field.
- The finalization of a common European approach is in progress but requires some more years to reach a European testing standard.
- Full-scale façade tests are currently the only method available for determining the fire performance of complete assemblies.

Source: https://www.thesun.co.uk/news/3802969/timeline-shows-how-grenfell-tower-became-a-raging-inferno-which-burned-at-1000c/

Introduction



Methods – National testing methods in Europe

Test methods	Countries using the test method
PN-B-02867:2013	Poland
BS 8414-1:2020 and BS 8414-2:2020	UK, Republic of Ireland
DIN 4102-20:2017	Switzerland, Germany
ÖNORM B 3800-5	Switzerland, Austria
Prüfbestimmung für Aussenwandbekleidungs-systeme	Switzerland/ Lichtenstein
Technical regulation A 2.2.1.5	Germany
LEPIR 2	France
MSZ 14800-6:2020	Hungary
SP Fire 105	Sweden, Norway, Denmark
Engineering guidance 16 (unofficial test method)	Finland
ISO 13785-2:2002	Slovakia
ISO 13785-1:2002	Czech Republic

Methods – The Hungarian method

- Large scale method
- Single vertical wall with two openings
- Real rooms behind the testing wall
- Fuel: 650 kg timber crib, 3,2MW
- Duration max 45 min (0-15-30-45)
- Outdoor or indoor

Methods – The Hungarian method

Scope:

1. Combustible and ventilated façade solutions applied on non-combustible basis wall

2. Special façade solutions, where the vertical distance between the openings is less than a certain value (1,3m)

3. Other façade structures with openings - solutions without non-combustible basis wall - solutions including a fire barrier - other innovative solutions

Methods – The Hungarian method

1. Fire spread (horizontal/vertical)

2. Temperature measurements in 18+16 locations (calculated temperature difference + if neccessary temperatures in floor connection)

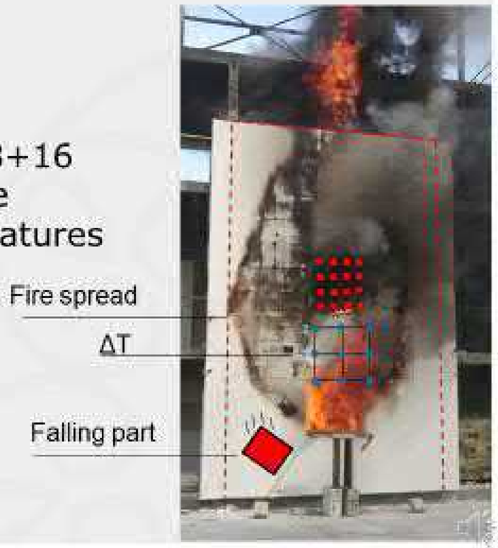
3. Falling parts (< 5 kg)

Methods – The Hungarian method

1. Fire spread (horizontal/vertical)

2. Temperature measurements in 18+16 locations (calculated temperature difference + if neccessary temperatures in floor connection)

3. Falling parts (< 5 kg)



Results

- The Fire Laboratory of ÉMI performed more then 200 tests with the former version of the standard (mostly thermal insulation systems (ETICs) and claddings).
- A lot of experience has been gained over the years.
- In 2019 the Hungarian Standardisation Institution trusted the ÉMI LLC. for drafting a new version of MSZ 14800-6.

Results – Changes in MSZ 14800-6

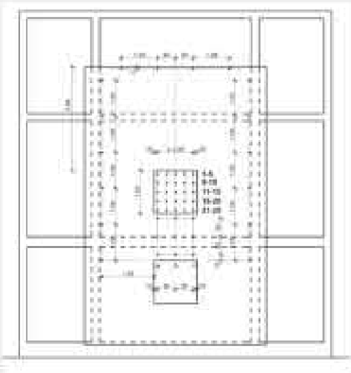
1. Moveable wing wall - optional

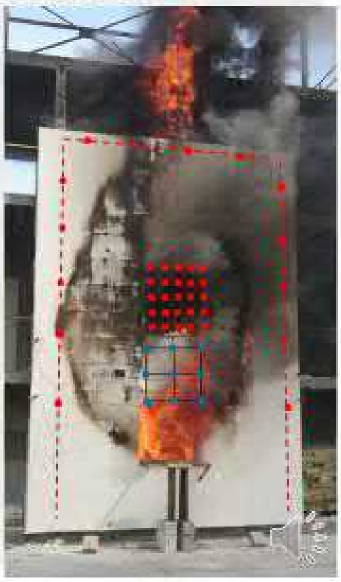
Results – Changes in MSZ 14800-6

1. Moveable wing wall - optional

Results – Changes in MSZ 14800-6

2. Additional thermocouples for inspecting the fire propagation





Results – Changes in MSZ 14800-6

3. Measurement of smoke density and toxicity – optional

Source:
https://www.ft.com/content/3a38b9a4-58b8-11ea-a528-dd0f971febbc

Results – Changes in MSZ 14800-6

4. Additional requirements relating to the testing rig (size, material etc.)

5. Additional requirements relating to to measurement of falling parts

6. More detailed technical drawings.

Discussion, Conclusion

In conclusion, the new MSZ 14800-6:2020 retained its key features and was enriched with many new developments.

It is also one of the most advanced test procedures in international comparison.

The currently optional test parts can be displayed as an actual requirement only after longer experience with it.

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
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23rd February, 2021 Budapest, Hungary
Temperature on car doors exposed to fire – pre-test
Jozef Svetlík – Linda Makovická Osvaldová
Department of Fire Engineering; Faculty of Security eEngineering; unversity of Zilina
VÉDELEM ONLINE


Doc. Ing. Jozef Svetlík, PhD. is currently the head of the Department of Fire Engineering, University of Žilina in Žilina. In 2001, he completed his university studies in the field of crisis management. In 2002, he joined the Department of Fire Protection as an assistant professor. In 2009 he defended his dissertation on the topic "Multi-criteria selection of firefighting equipment". Since 2018 he has been a full associate professor in the field of rescue services. He defended his habilitation thesis on the topic "Experimental investigation of car fires". In his educational and scientific research activities in 2002, he deals with the issue of water supply by fire brigades in fighting fires, tactics of intervention by rescue services, as well as vehicle fires, especially personal motor vehicles.
He actively participates in solving scientific research tasks in the subject area. These are the tasks of international (FP7, IPCEI) and national grant schemes. He presents the results of his creative activity at international conferences and seminars, as well as through Erasmus + lecture mobilities in Poland, Hungary, Bulgaria, the Czech Republic, Slovenia, Croatia, Serbia and Spain.
doc. Bc. Ing. Linda Makovická Osvaldová, PhD. is an associate professor at the Department of Fire Engineering at the Faculty of Security Engineering. She is involved in teaching the subjects of Safety and Health Protection in the Fire and Rescue Corps, Fire Safety of Technological Processes and Fire Testing, and in teaching Erasmus+ students. In her scientific and educational activities, she deals with the issues of occupational safety and health protection of rescue forces, testing of materials used in technological processes and in building constructions, as well as with natural materials in forest fires and their impact on the safety of rescue corps in fire fighting. She works within the field of occupational safety and fire prevention (development of e-learning modules for training of employees). She is an active member of both domestic and foreign organizations: The Slovak Association for Occupational Safety and Health and Fire Protection; Common vision: Work safety in the building industry in the Czech Republic; and The American Association of International researchers (AAIR). She is a member of several editoral boards of foreign and domestic magazines: Bezpečná práca, Journal of Engineering and Architecture, Acta Universitas Matthiae Belii séria Enviromentálne manažérstvo, European Journal of Environmental and Safety sciences, Delta journal. Her scientific research activities are varied and published both in indexed journals and in indexed conferences. She is active in international fora where she has presented the results of various projects.

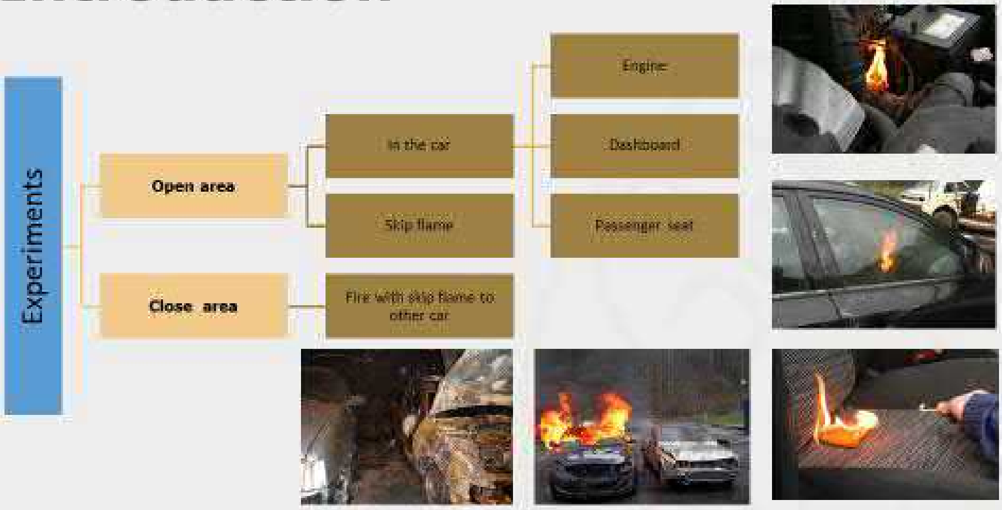
Content of the presentation

- Introduction
- Methodology of the Experiment
- Results and Discussion
- Conclusion
- References

Abstract

Fires of passenger motor vehicles are a part of life. They can be seen in the streets at any hour, and most often happen when the vehicle is parked. The article deals with the effects of simulated fire on the structural elements of cars (doors) while recording the temperatures and the flow of radiant heat. The experiment was carried out in a fire room and verified the methodology of evaluating the behavior of car doors under thermal stress caused by a fire from a liquid spill. The results of experiments can serve as a basis for the car fire simulations in both enclosed and open spaces.

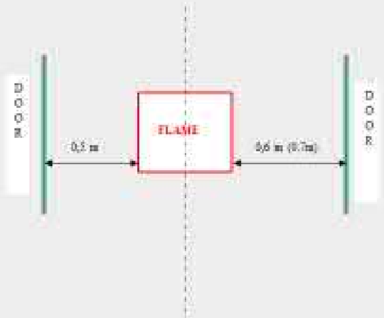
Introduction

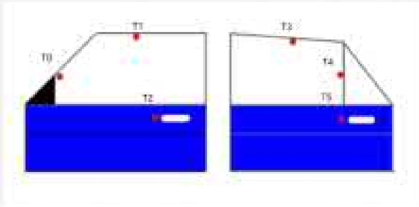


Methodology of the Experiment

- experiment focused on the thermal stress the car door is exposed to in the case of a fire at a car park or parking garage,
- in the fire room of the VVUÚ, a.s.; Ostrava Radvanice; Czech Republic;
- 6 termocouple (NiCr – Ni) on the door;

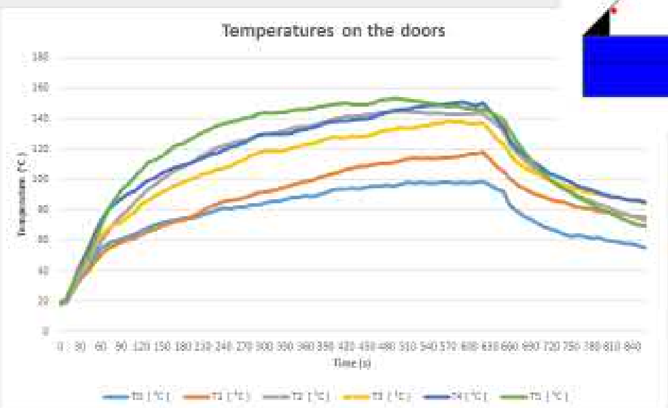
Measuring position

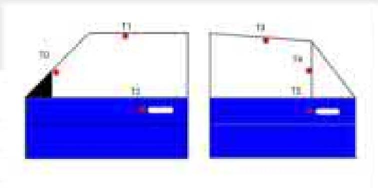




- 6 temperature sensors on the doors
- iniciation with petrol BA 95 (20 litres)
- size of tank was 0,5 m x 0,5 m x 0,2 m - car window position

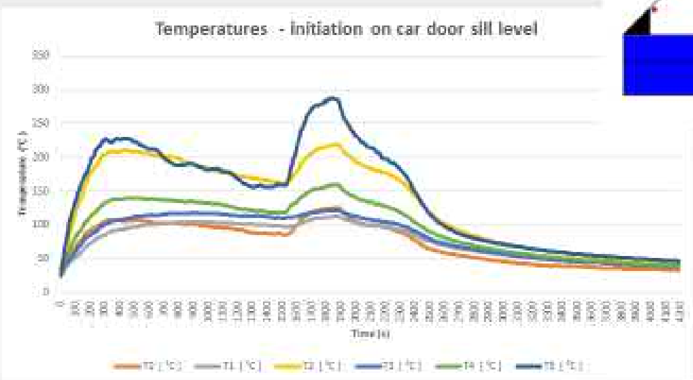
Results

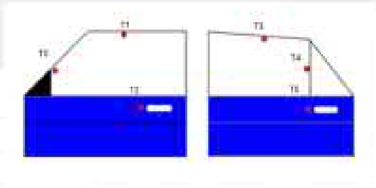




- Burning time - 860 seconds
- After 10 minutes, decrease the flame - consumed the oxygen
- Max temperature was 160 °C

……. floor position flame



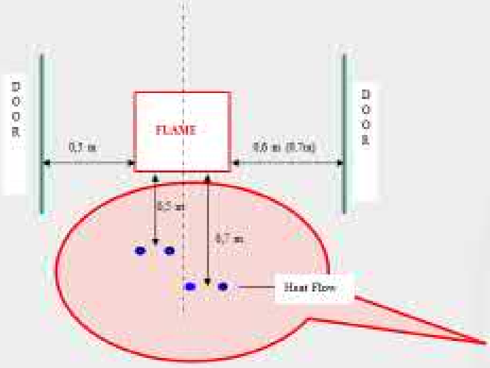


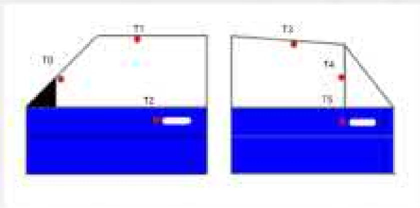
- Burning time – 70 minutes
- After 10 minutes, decrease the flame -consumed the oxygen,
- Open the door to burning area – increase the flame and temperatures
- Max. temperature was 286 °C

Discussion

- doors ignition are problematic in case of no wind - ***damage occurs, but seldom initiates,***
- We have to:
  - change the position of ignition at floor level or below – best heat radiation,
  - refine the measurement using heat flow sensors,
  - compare results from external experiments,
  - adjust the measurement methodology.

Change the measuring position





- 6 temperature sensors on the doors
- iniciation with petrol BA 95 (20 litres)
- size of tank was 0,5 m x 0,5 m x 0,2 m - car window position
- Heat Flow Senzors

Conclusion

- Both experiments represented pilot trials,
- All experiment - conventional fuels – What the others?
  - LPG, CNG....
  - Hydrogen...
  - Hybrid and electric vehicles?

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Compartment Fire Modelling
Andrea Majlingova, Patrik Tischler
Technical University in Zvolen, Slovakia
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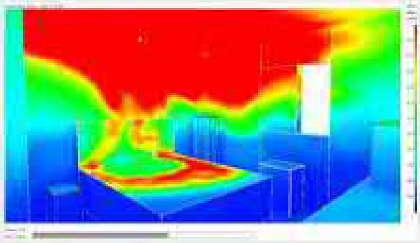
Authors
Andrea Majlingova – associate professor at the Technical University in Zvolen, Faculty of Wood Sciences and Technology, Department of Fire Protection (Slovakia). In her research she is engaged in modelling and simulation of fires (compartment, wildfire), assessment of natural phenomena risks using the GIS tools in interconnection to disaster management.
Patrik Tischler – PhD. student at the Technical University in Zvolen, Faculty of Wood Sciences and Technology, Department of Fire Protection (Slovakia). In his PhD. study he is engaged in modelling the compartment fires and linkage of fire modelling results with evacuation modelling and planning.

Contents

- Introduction
- Basis for description and calculations of fire development in fire dynamics
- Fire models and compartment fire modelling



Abstract

- Modelling of fire behaviour represents an important part of fire science or fire engineering allowing the experts to study and understand behaviour of a fire. The outputs of fire modelling are important as for fire prevention, fire investigation practise, but also for buildings designers and for incident commanders (firefighters) to choose the most effective and safe fire tactics. There are introduced the fire models and software used for compartment fire modelling.

Introduction

- An integral part of fire engineering and fire safety of buildings is the knowledge of the combustion process and predicting the dynamics of development of the internal / compartment fire.
- In recent years, several computer programs, computer fire models have been developed, that allow to model the course of a fire. It is a very progressive approach, which has its application in the design of fire safety of buildings, selection of suitable materials and structures, design of effective stable fire extinguishing equipment or in fire investigation, verifying specific scenarios of fire origin and development.
- This contribution is devoted to a introduction of the issue of fire modelling, as well as individual software used for this purpose.

Basis for description and calculations of fire development in fire dynamics

- The description of the development of a fire in the fire dynamics is based on data on the rate and amount of energy released, energy transfer mechanisms and environmental parameters.
- For a qualitative and quantitative description of fires, it is necessary to proceed from the definitions of basic concepts in fire dynamics and from calculations related to the combustion process of relevant materials, the origin, propagation and spread of fire and factors affecting fire development. For the correct calculation (estimation) of the rate and amount of energy released, the decisive characteristic is the volume of combustible material (fuel). To obtain input data, we can also use the results of experiments of fire parameters of flammable materials.
- In the case of flammable liquids and flammable polymeric solids as well as some products, thanks to the experiments performed so far, accurate data on released energy, burn-up rate, rate of formation and concentration of flue gases, etc., are available in various databases. However, in the case of the use of such data, the availability and speed of oxygen access must be considered in a specific case, i.e., ventilation conditions. When applying computer modelling, it is appropriate to use software that has a database of materials in order to select the most appropriate energy release rate curve.

Fire models and compartment fire modelling

- Fire modelling can be considered as one of the tools to understand the behaviour of fire. This tool can be used to verify individual hypotheses, fire scenarios or to obtain a description of the course of the fire.
- **Fire models** can generally be divided into three large groups. These are **empirical**, **physical** and **mathematical** models.
- Mathematical and physical models are mainly used for modelling of compartment fires.

Empirical models

- They are based on experience (empiricism) obtained from observations of previous fires and fire tests, based on which are derived physical correlations and laws describing the behaviour of fire under specific conditions. The models solve the fire process in 2D space.
- They involve a very limited range of combustion physics and chemistry and perform a quick calculation (usually a serial computer is sufficient).

Physical models

- A physical model is an artificially created object that can be used to clarify a physical phenomenon or new knowledge. Models aimed at describing the course of a fire try to reproduce the phenomena accompanying the fire in simplified physical conditions. Therefore, no physical model captures all aspects of the real phenomenon and cannot identify with the real phenomenon. The real physical phenomenon is always more complex and complex than its model. Physical models are also usually more time and money consuming than mathematical models.
- The purpose of physical models is to imitate a fire under simplified physical conditions. The dimensions of these models are different. The course of a fire in real conditions is most like large-scale tests.

Mathematical models

- Mathematical models are based on the numerical solution of differential equations solved for real values or for discretized temporal or spatial quantities.
- Mathematical models are used to model fires in small-scale 3D spaces. Their development was conditioned by the formulation of physical and chemical processes during fires. These models are based on the laws of conservation of mass, momentum, energy and component (equation of state), fuel combustion and thermal radiation models. In this way, the phenomena occurring at any point in 3D space can be determined relatively accurately, while the individual points interact with each other.
- Mathematical models can generally be divided into:
  - **deterministic models,** in which the course of a fire is determined by physical and chemical processes; and
  - **probabilistic models**, in which the development of a fire is described by a whole set of random events or phenomena.

Deterministic mathematical models

- Deterministic mathematical models are further divided into **zone models**, **field models** and **simulation models**.
- **Zone models:** generally, are divided into single-zone and two-zone. Zone models are greatly simplified, they neglect the heat capacity of objects in the room, the friction of liquids, the time required to transfer fire products to the ceiling of the room, etc.
- Systems based on the application of zone models include **ARGOS**, **CFAST**, **BRANZFIRE**.

Deterministic mathematical models

- **Field models**: are often referred to CFD (Computational Fluid Dynamics) models in practice. The method consists in creating a three-dimensional computational network, where the properties within one cell are constant.
- **CFD fire propagation models** are based on gas dynamics and on the experience gained from the use of CFD computer programs based on the laws of conservation of mass, momentum and energy. The calculation is based on partial differential equations, Navier-Stokes equations containing the second derivatives by space and the first derivatives by time. These equations address fluid flow, gas dynamics induced by heat released from fire, considering frictional internal forces. CFD models generally include sub-models that address fire-related processes such as combustion, heat transfer, gas turbulence, etc. Some of the CFD models are based on RANS (Reynolds averaged Navier – Stokes) equations, which are time-approximated equations of motion for fluid flow, originally designed to describe turbulent flow.
- Among the most used CFD systems, based on the application of field models, which can be used in the case of modelling the behaviour of compartment fires belong systems such as **Fire Dynamic Simulator - FDS** and its graphical interface **PyroSim** and **SMARTFIRE**.

ARGOS

- The ARGOS program is based on the application of a zone model. It is used to calculate and evaluate the fire risk with a prognosis of the spread of combustion products, temperature development in the case of fire, heat transfer, etc. The fire can be modelled in the range of several rooms simultaneously.
- ARGOS allows the documentation of risk analysis, online presentation of simulation results, contains a system for calculating the reaction time of the sprinkler and also includes the time of arrival of firefighters. In the ARGOS archive, the user can choose one of different types of fire (solids fire, liquids fire, liquid bottle fire, object decay). In addition, it allows the user to set their own fire input data.
- ARGOS provides output information (texts, tables and graphs), that is why it does not require subsequent processing of results in another program.
- ARGOS is mainly used by researchers, insurance companies, fire investigators and industrial companies to prevent major industrial accidents.

CFAST

- CFAST represents a consolidated model that allows modeling of the spread of fire and smoke in the entire environment (in all rooms) of a particular building.
- It was developed in the Fire Research Division of the National Institute of Standards and Technology (NIST). It is available as a freely distributable program.
- It is a two-zone fire model that predicts the temperatures caused by a fire within a fragmented building (it allows to model a fire in up to 30 rooms simultaneously). Each substructure of this building is divided into an upper and a lower layer of gas (the zone in the sense of the zone of the fire model indicates the layers that are modelled). In the case of a fire, the products of combustion are usually spread by the rising flow of flue gases from the lower layer to the upper layer. The temperature in each layer is the same and its evolution over time is described by a set of differential equations derived from the basic law of conservation of matter and energy. The spread of smoke and heat from zone to zone is given by empirical correlations. Because the equations used to calculate the spread of fire and smoke are relatively computationally intensive, simulations in CFAST when working with a regular personal computer usually take only a few tens of seconds.
- It uses the SmokeView program to display modeling results.

BRANZFIRE

- It is a computer zone model that allows to model the spread and calculate selected parameters of fire and smoke simultaneously in up to 12 rooms. It includes a flame propagation and fire development model fully applicable to compartment fire modelling. It is designed mainly for modelling corner fires in accordance with ISO 9705, i.e., corner test. The flame spread and fire development model is based on the application of mathematical equations derived by Quintier.
- The input data to the modelling are data obtained from a conical calorimeter. The model allows to calculate the temperatures of gases in individual layers, the height of the neutral plane, pressure and rate of air flow, surface temperature, content and concentration of combustion products in individual rooms of the structure.
- Currently, BRANZ is gradually replacing this program with the newly developed B-RISK program, which is a combination of deterministic / probabilistic fire model that allows fire and smoke propagation to be simulated indoors and uses the Monte Carlo probabilistic simulation method in simulations for repeated iterations of the same scenario.

Fire Dynamic Simulator - FDS

- Freeware for computer simulation of fire, in which CFD model of fire is implemented, able to use computing capacity of current computers.
- FDS is generally a complex software system that simulates the flow of gases induced by fire, the spread of heat by radiation, combustion, estimating the concentration of substances released during a fire.
- It can simulate fires in various structures, such as buildings, garages, tunnels, technical equipment (e.g., cars).
- It does not need to model a fire to solve gas dynamics, so it can also solve, for example, the movement of toxic gases in areas without fire. All input data is entered using a single text input file. The most difficult is often to define the geometry of the modelled space.
- In order to make the simulation of a fire as accurate as possible, it is necessary to define the geometry and properties of all structures, objects and openings in the given space necessary for the fire and its propagation modelling. Depending on their chemical and physical properties, they can then act as a barrier to the spread of fire and gas flow, conduct or radiate heat, or burn. They can also dampen the intensity of the fire or be inert to it (they are not affected by fire and have no effect on the fire).
- To facilitate the work, it is possible to use graphical user interfaces such as PyroSim or BlenderFDS.

SMARTFIRE

- It can simulate hot, turbulent and rising gas flows in any large and fragmented object. It can work with an irregular network of control volumes. Combustion can be defined by the volume source of heat or the amount of gaseous fuel. In addition, it contains a predefined library of materials that can be added.
- SmartFire is also one of the few models that can work with the evacuation model - EXODUS. The results of this model are close to reality. This creates a link between the model simulating the fire scenario with all the manifestations of the fire and the model aimed at determining the time and course of the evacuation.

Conclusions

- The technologies used to study fire behaviour parameters currently have progressive scientific and computational tools to make significant advances in fire engineering, notably in modelling the fire behaviour in a computer environment, and further in the development of fire safety standards for constructions, construction elements and the entire constructions.
- Disasters, such as the collapse of the World Trade Center in 2001 or the catastrophic fire of a multi-storey residential building in London in mid-June of 2017 have shown, that new approaches, progressive and sophisticated methods and technologies must be implemented in fire engineering.

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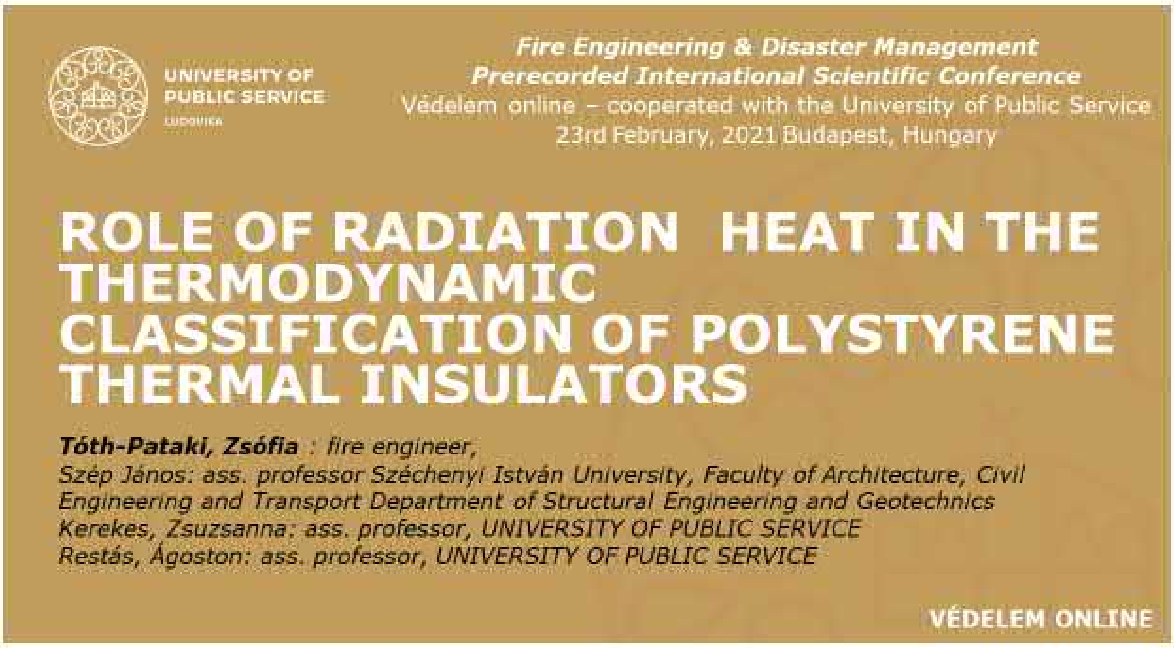
Section B – Fire protection

Zsófia Tóth-Pataki - János Szép – Zsuzsanna Kerekes - Ágoston Restás: *Role of radiation heat in the thermodynamic classification of polystyrene thermal insulators*



Structure:

1 . Abstract

2. Introduction of the presentation

3. Insulating test material samples

4. Test methods

5. Test results

6. Discussion, Conclusion

7. References

1. Abstract

The coating of buildings and facilities with insulating material is of paramount importance in connection with energy efficiency. Insulation is manufactured differently depending on the type, but they are certified according to a uniform standard [1].

In the present dissertation, we examine the three most common "white" EPS, XS and graphite materials, whether the so-called EUROCLASS EN 11 925 so-called small flame test. Furthermore, do the effects of cutting surfaces in practical use on fire protection show a difference between "factory cut" surfaces and "home cut".

The small flame test showed that since there is no flame combustion, so the flame propagation does not give a meaningful qualification among the EPS samples., Therefore, further tests should be continued with radiant heat. On the other hand, the radiant heat reaches the material over a larger area, so that an early effect of the fire can be better modeled. Burning of the materials is always preceded by the preliminary heat load, with significant damage, which already makes a significant difference between the individual samples. This is because the deformation increases at a very faster rate than the burnout itself.

2. Introduction of the presentation

Due to the diversity of the materials sold, the differences due to the production technology, the different areas of application and the variety of coating systems, completely new features appear [2] [3]. That is, they will behave differently not only under direct flame but also under heat load.

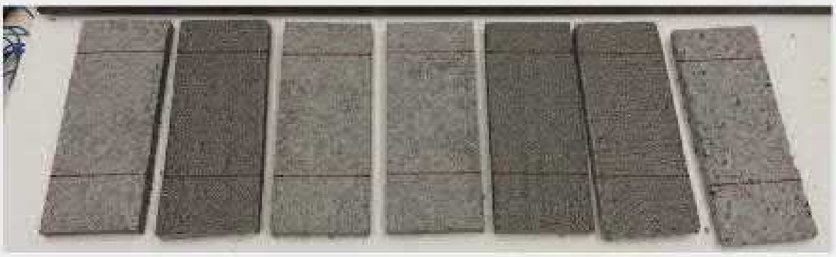
When non-flammability, fire propagation limit, chemical composition, tensile strength, densities, thermal conductivity value are given in the rating, the features related to thermal radiation are not. Yet the presence of flame is always preceded by heat.

In our work, we examine whether it is sufficient to give a direct flame effect for the classification of insulation materials, or whether heat-insulating insulators exposed to radiant heat show significant damage.

3. Insulating test material samples based polistyren and and their characteristics

1.Group : For the small flame test : EPS (white) and graphite systems are compared. Both samples have different factory surfaces: "factory cut" edges and "home cut".

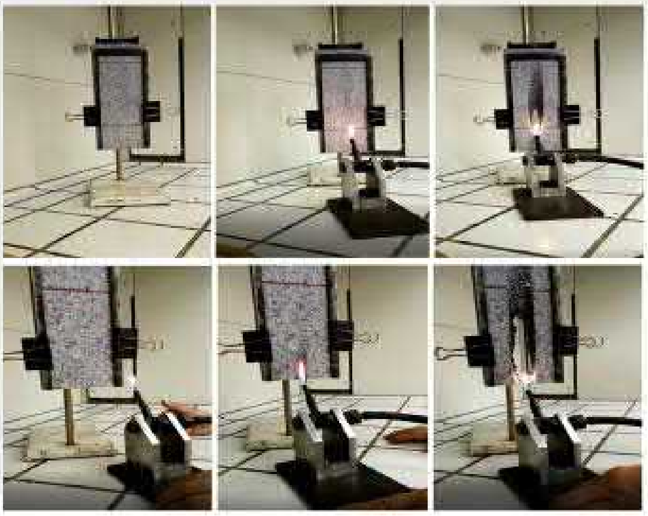
2.Group For the effect of radiation thermal heat (EPS, XPS and graphite systems) are compared with a factory surface . . The tests were performed on EPS80, EPS100, Graphite, Flame Retardant Graphite, XPS, XPS expert materials. The size of the test samples is 10x10 cm and their thickness varies from 15 to 25 cm 0



[4] [5]

4. Test methods

4.1 EN ISO 11925-2 reaction to fire tests-ignitability [6]



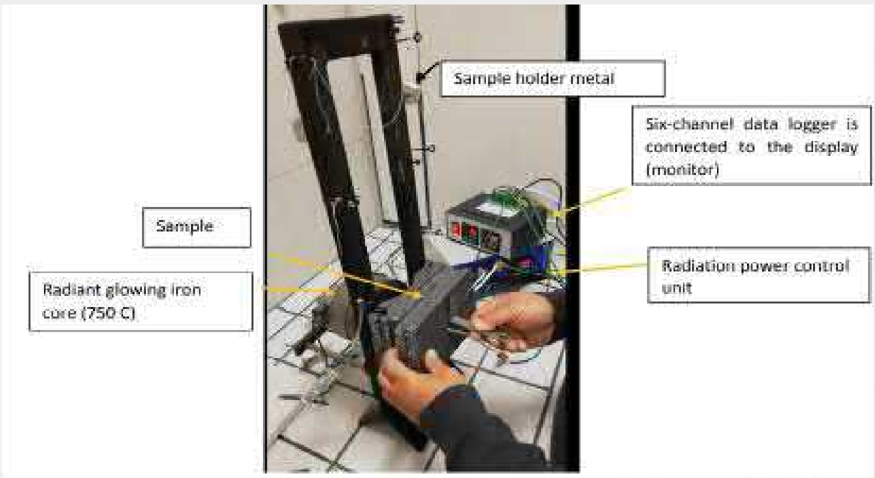
OF BUILDING PRODUCTS SUBJECTED TO DIRECT IMPINGEMENT OF FLAME- PART 2: SINGLE-FLAME SOURCE TEST

Measurement methods: Surface ignition graphite and white EPS

Edge ignition graphite: graphite and white EPS

Sample thickness: 10-17 mm, size: 19x 10 cm

4.2. Description of the radiant heat test



The test is based on the ISO EN 6941 standard, which includes the radiant heat-emitting iron core.

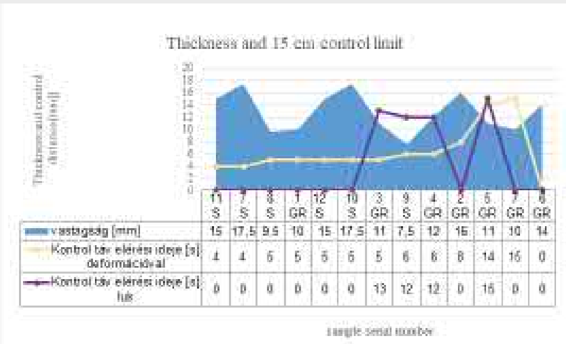
5.1 Result of EN ISO 11925 of EPS (white) and Grafith (Gr)

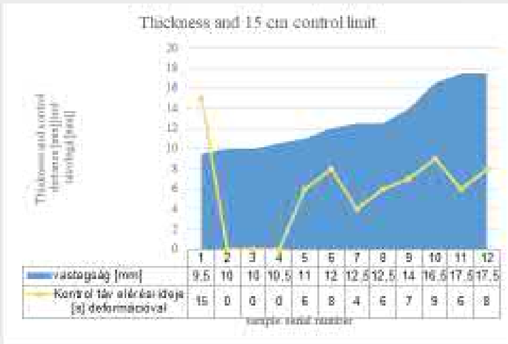
The "Single-flame source test" according to EN ISO 11925-2: 200 specifies whether the rate of flame propagation after the surface and edge ignition, using an ignition source, reaches the upper control signal. and other experiences (eg burning drip)

Furthermore, we set the burn-through time for different thicknesses.

[7] [8]

5.1 Results of radiant heat testing of expanded polystyrene foam.



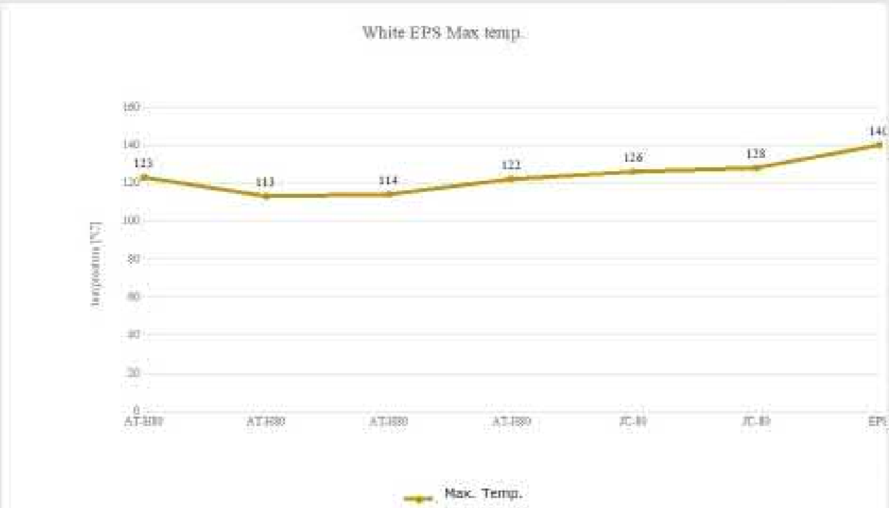


Small Flame Test - Relationship between Sample Thickness and Test Control Limit: Surface (l)and Edge (r) Ignition [9].

5.2 Results of radiant heat ac. EN 13 773 in EPS (white) and Grafith (Gr)

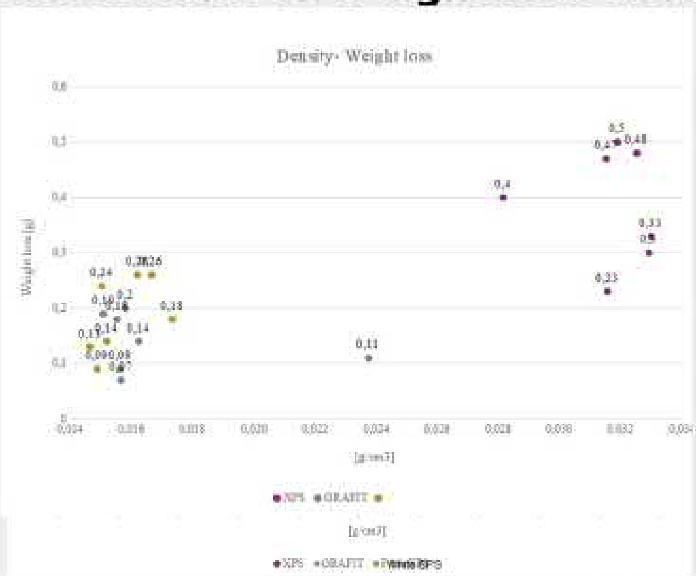
Group 1 Maximum temperatures reached in Graphite samples:

Group 2 : Maximum temperatures reached in white EPS samples



Group 3 : Maximum temperatures reached in white XPS samples

5.3 Results of Weight loss test



For denser XPS products, we get higher losses occur due to heat.. We can't really talk about combustion, but the evaporation of additives and the release of gases can cause a tenth of a gram difference from additive-free white and graphite

6. Discussion, Conclusion

The small flame test did not provide enough information about the samples, i.e., it does not show the difference between each sample because there is no flame combustion. The following tests must be carried out with radiant heat. On the other hand, the radiant heat reaches the material over a larger area, so that an early effect of the fire can be better modeled. Burning of materials is always preceded by a preliminary heat load, which also has a damaging effect. The deformation also increases at a much faster rate than the burnout itself. Furthermore, our test series highlighted the importance of the surface quality: what surface the heat meets: a surface cut with a factory heating wire, or a sawn / polished surface

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
DANGER OF DUST EXPLOSION AND IMPORTANCE OF TESTING FOR EXPLOSIVE DUSTS
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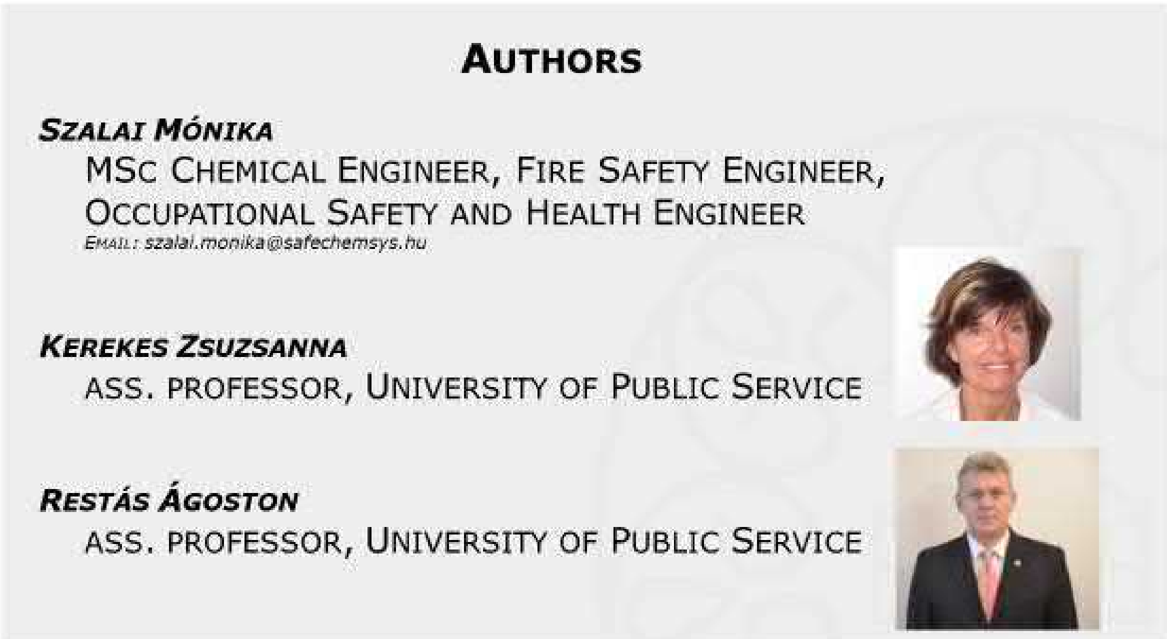
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Structure:

1. Abstract

When assessing dust explosion risks in industrial environments, one challenging and poorly understood question is "***what should we test***"? ***For liquids and gases, flammability data*** (at least under atmospheric pressure and normal temperature conditions) ***are well understood*** and available in the open literature for most common liquids and gases.
Such data for dusts is more limited because of the major impact of particle size, moisture content and even particle morphology.
The complexity is compounded often as many products are made up of a number of components, so that there is a virtually unlimited number of "materials" in existence with properties different from the individual components. Even worse is the situation that those secondary components are not always obvious in the name.
The main hazard characteristics of powders associated with dust explosion can be categorised as ignition sensitivity, explosion severity, flammable limits and electrostatic properties .

Main hazard characteristics of combustible dusts

- Ignition sensitivity
- Explosion severity
- Flammable limits
- Electrostatic properties

The main hazard characteristics of combustible dusts can be determined by laboratory tests.
This presentation provides some insight into what tests need to be performed to design the appropriate equipment for an explosive hazard for a given explosive technology, to select appropriate explosion-proof equipment, and to identify explosive zones in accordance with the ATEX Directive.

2. Combustible dust

Combustible dust: *finely divided solid particles, 500 µm or less in nominal size, which may form explosive mixtures with air at standard atmospheric pressure and temperatures*

Combustible flyings: *solid particles, including fibres, where one dimension is greater than 500 µm in nominal size, which may form an explosive mixture with air at standard atmospheric pressure and temperature*
Material, fibres and flyings produced by machinery found in industries such as textile, cotton and wood cutting which settles around equipment and is vulnerable to ignition from heat or sparks.

Non-conductive dust: *combustible dust with electrical resistivity greater than $1x10^3$ Ωm*
Particles produced by agricultural and chemical industry such as cereal grains, flour, milk powder, pharmaceuticals, animal feed and coal that settle on equipment in layers and form clouds of dust in the air.

Conductive dust: *combustible metal dusts and other combustible dusts with electrical resistivity equal to or less than $1x10^3$ Ωm (Metal dust is treated as conductive dust because it is assumed that surface oxidation cannot be depended upon to always ensure electrical resistivity greater than $1x10^3$ Ωm)*
Metal particles such as Aluminium or Titanium that are deposited on equipment as dust layers and form as dust clouds in the local atmosphere.

Dust Groups in ATEX

Type of combustible dust present in the atmosphere:

IIIA – Combustible flyings

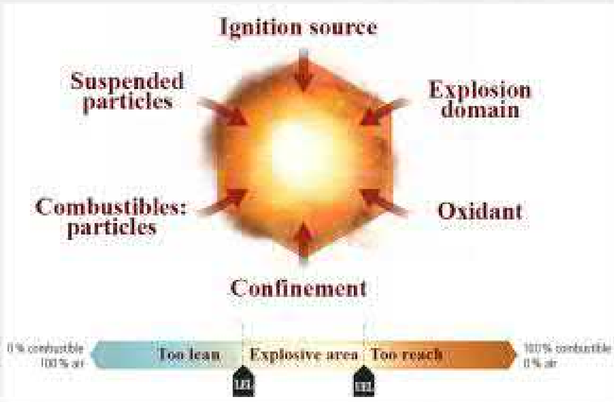
IIIB – Non-conductive dust

IIIC – Conductive dust

3. What is the difference between a dust fire and a dust explosion?

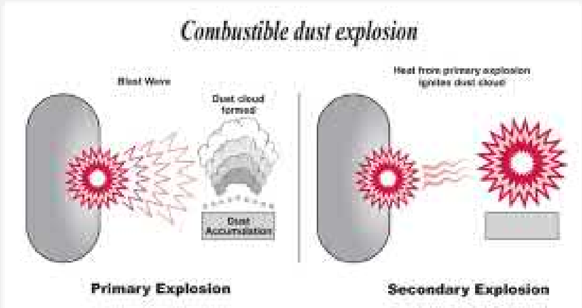
Fire

Dust explosion

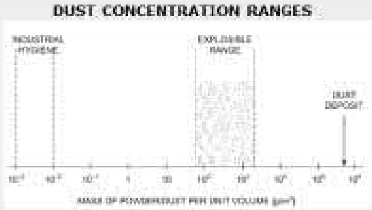


[1], [2], [3]

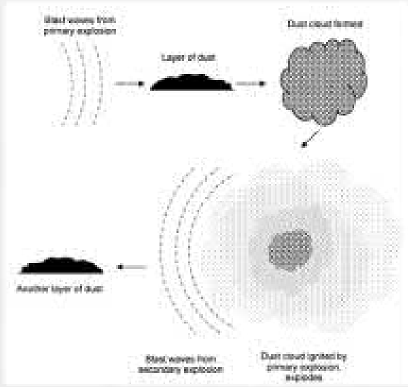
4. Primary and secondary dust explosions



DUST CONCENTRATION RANGES



[1], [2], [4]



5. Dust testing for fire and explosion properties

How could a dust be ignited in this process?	Test	Main Purpose
Hot surface	Layer ignition test Cloud ignition test	Used to specify equipment surface temperature limits
Self heating		
Electrostatic spark	Minimum ignition energy	Safe use of highly insulating materials, and other precautions, against static electricity
What would be the consequences?	**Test**	**Main Purpose**
Can the dust explode?	Vertical tube test Particle size analysis	Are precautions against an explosion risk needed?
How do I design the plant and process to preventor minimise the consequences of an explosion?	**Test**	**Main Purpose**
Can I avoid dust clouds capable of exploding?	Minimum explosible concentrate	May demonstrate the risk is minimal in some applications
How violent would an explosion be?	K_{St}, Pmax measurement	Design of explosion vents or suppression system
Can the explosion risk be prevented by excluding air?	Limiting oxygen concentration	Used in the design of plants protected by inerting

6. Safety characteristics of dust suspensions

Main hazard characteristics of combustible dusts

— Ignition sensitivity:

Minimum Ignition Energy (MIE)

Minimum (Cloud) Ignition Temperature (MIT)

(5 mm) Layer Ignition Temperature (LIT)

— Explosion severity

Explosion severity analysis using 20 L or 1 m^3 sphere:

The test generates data for maximum dust explosion pressure (P_{max}), dust explosion constant (K_{st}) and class (St)

— Flammable limits

— *Limiting oxygen for combustion (LOC)*

— *Minimum explosive concentration (MEC)*

— Electrostatic properties

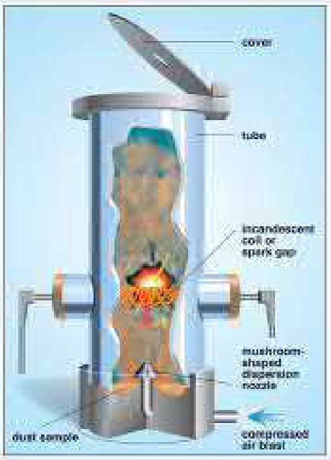
— *Powder volume resistivity*

Important Dust Explosibility Parameters

Parameter	Typical units	Description	Example industrial applications
P_{max}	bar(g)	Maximum explosion pressure in a constant-volume explosion	Containment Venting Suppression Isolation Partial inerting
$(dP/dt)_{max}$	bar/s	Maximum rate of pressure rise in a constant-volume explosion	As per P_{max}
K_{st}	bar·m/s	Size- or volume-normalized (standardized) maximum rate of pressure rise in a constant-volume explosion	As per P_{max}
MEC	g/m^3	Minimum explosible (or explosive) dust concentration	Control of dust concentrations
MIE	mJ	Minimum ignition energy of a dust cloud (electric spark)	Removal of ignition sources Grounding and bonding
MIT	°C	Minimum ignition temperature of a dust cloud	Control of process and surface temperatures (dust clouds)
LIT	°C	Minimum ignition temperature of a dust layer or dust deposit	Control of process and surface temperatures (dust layers)
LOC	volume %	Limiting oxygen concentration in the atmosphere for flame propagation in a dust cloud	Inerting (with inert gas)

[1], [2], [4]

7. Minimum Ignition Energy – MIE



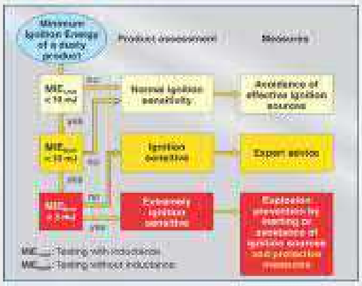
The Minimum Ignition Energy (MIE) is very important for dust explosion risks analysis, it will show how easy a dust cloud can be ignited. The MIE is equal to the minimal energy needed to be brought by a spark to a dust cloud of a given concentration in order to ignite it following a specific experimental procedure

This test method covers the determination of the minimum ignition energy of a dust cloud in air by a high voltage spark. Data obtained from this test method provides a relative measure of ignition sensitivity of a dust cloud.

MIE typically range from 1 mJ to 1000 mJ

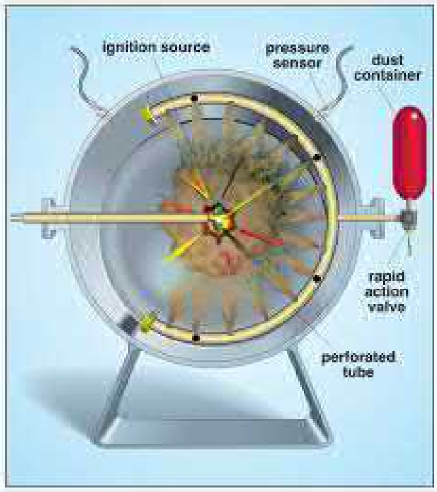
The lower the MIE, the higher is the risk of explosion as a very small energy input can trigger a dust cloud explosion.

***MIE < 3 mJ** should be processed with specific measures, the dust is extremely sensitive to ignition.*



[3], [10], [11]

8.1 DETERMINING DUST EXPLOSION PARAMETERS



The maximum explosion overpressure p and the maximum rate of pressure rise (dp/dt)max or the explosion constant Kmax (KStvalue) describe the reaction behavior of a dust.

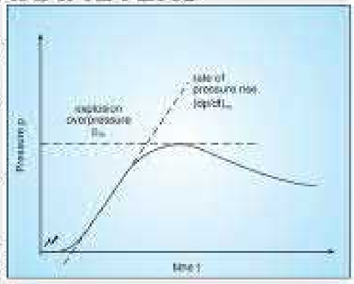
Test apparatus

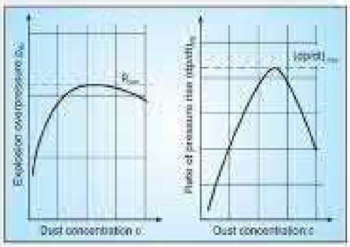
Chemical igniters with a total energy of 10 kJ are used as the ignition source in both cases.

Test procedure

The procedure is similar to that used in the test of the explosibility of dust/air mixtures. The change in pressure with time is plotted and used to determine the values for the explosion overpressure pm as well as the rate of pressure rise (dp/dt)m. The tests are performed over a wide range of dust concentrations until the maximum values for the explosion overpressure and the rate of pressure rise are found.

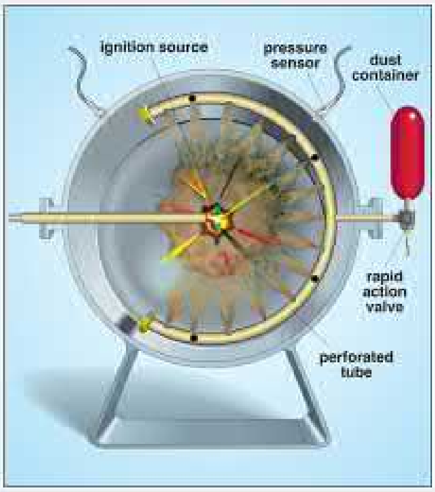
The determination of the maximum explosion overpressure p_{max} and the maximum rate of pressure rise $(dp/dt)_{max}$





[2], [5], [7], [8]

8.2 MAXIMUM RATE OF PRESSURE RISE, K_{MAX} (K_{ST} VALUE)



Powder explosion severity will be defined by two characteristics:

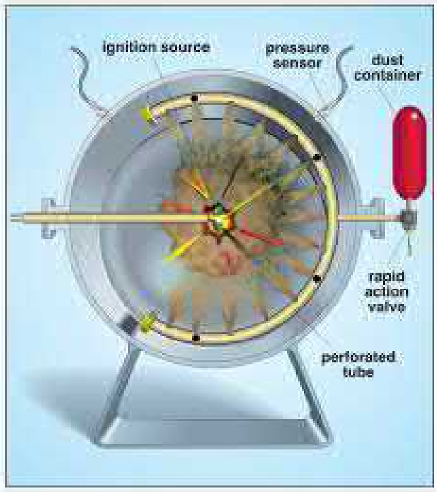
- *Maximum pressure during an explosion (P_{max})*
- *Maximum velocity of pressure elevation $(dP/dt)_{max}$, basis for the Kst calculation; Kst being a constant*

Explosion class	K_{St} bar.m.sec^{-1}	
St 0	0	No explosion
St 1	> 0 ≤ 200	Increasing severity of explosion
St 2	> 200 ≤ 300	
St 3	> 300 ≤ 600	

Dust tested	Median particle size µm	Minimum explosible concentration g/m³	Maximum explosion overpressure bar	K_{St} value bar.m/s	St class
Paper tissue	54	30	8.6	52	1
Glucose	30	60	9.2	123	1
Wheat	80	60	9.3	112	1
Polyethylene low density	50	15	8.6	125	1
Polymethyl methacrylate	21	30	9.4	269	2
Calcium stearate	12	30	9.1	132	1
Wood flour-various samples	65	60	7.7-10.5	83-102	1
Magnesium	28	30	17.5	508	3

[2], [5], [7]

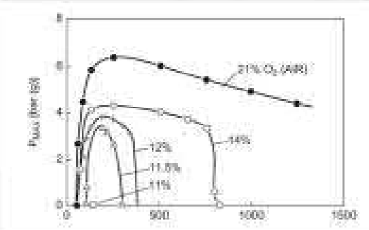
9. Limiting oxygen concentration – LOC

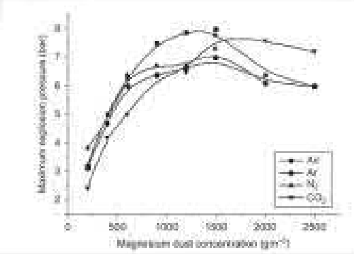


[2], [5], [7]

The limiting oxygen concentration is defined as the highest oxygen concentration in a dust/air/inert gas mixture at which an explosion just fails to take place. The limiting oxygen concentration depends on both the dust and the inert gas.

The tests for determination of the limiting oxygen concentration are performed in n the same explosive vessel. An explosible dust concentration is first determined which is then lowered in subsequent tests until the dust suspension can no longer be ignited.





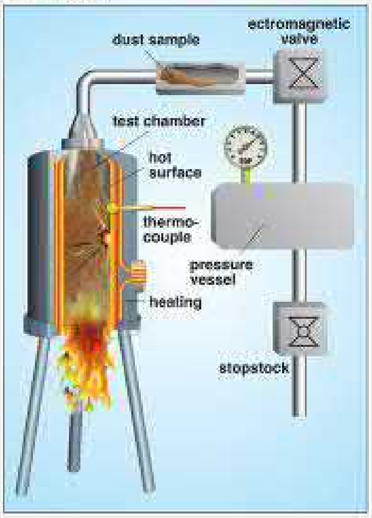
10. Minimum ignition temperature of dust clouds – MIT

Godbert-Greenwald Furnace

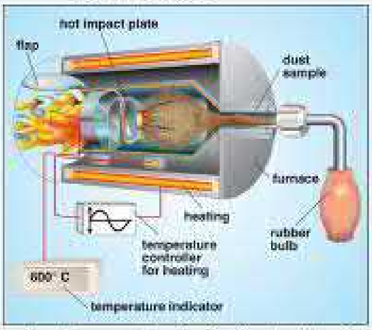
The ignition temperature of dust clouds in contact with a hot surface was traditionally determined in the Godbert-Greenwald furnace.

In this apparatus, the internal surface of a ***vertical cylindrical ceramic tube****, open at the lower end, is kept at a known, constant temperature and a sample of the powder is dispersed as a dust cloud into the tube from above by a blast of air. The automatically controlled temperature of the internal wall of the tube is changed in steps and the experiment repeated until the minimum temperature for ignition has been identified.*

[2], [8]

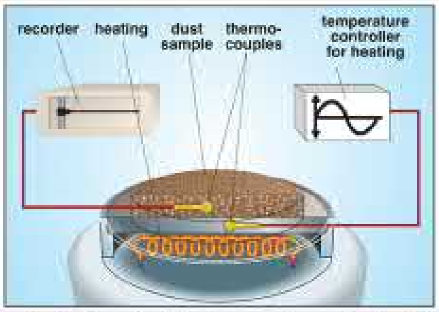


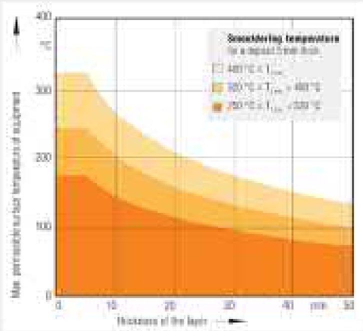
BAM Furnace



The experimental procedure is similar to that of the Godbert-Greenwald furnace, but the generation of the dust cloud is manual, by pressing a rubber bulb. However, because of the ***horizontal geometry****, the BAM furnace allows dusts that do not ignite directly in suspension to settle on the hot internal bottom of the furnace. In this way, smoldering gases can develop, which can ignite at a lower temperature than that required for direct ignition of the dust cloud. Ignition of smoldering gases normally occurs with a noticeable delay with respect to the dispersion of dust in the furnace.*

11. Minimum ignition temperature of a dust layer
5 mm Layer Ignition Temperature – LIT





The minimum ignition temperature of a dust layer is the lowest temperature at which a dust layer on a hot surface ignites.
The minimum ignition temperature of a dust layer of thickness 5 mm (smolder temperature) is defined as the lowest temperature at which ignition just takes place. [2], [8], [9]

If deposits of dust with thicknesses of more than 5 mm can accumulate on devices, the maximum permissible surface temperature must be reduced a cordingly. The diagram from the installation standard (EN IEC 60079-14) can be used as an aid here. Accordingly, where dust has an ignition temperature (smouldering temperature where the layer is 5 mm thick) of more than 250 °C, the maximum surface temperature must be adjusted to suit the characteristics. Where types of dust have an ignition temperature (smouldering temperature for 5 mm layer thickness) less than 250 °C or where there is a doubt about the characteristic curve, the dependence must be determined in laboratory tests.

12. Test on resistivity

Conductivity of the dust

From the point of view of electrical engineering, it is not possible to classify dust as precisely as the chemically defined gases and vapours. For that reason, it is considered sufficient to divide the dust according to type and conductivity.

EN ISO IEC 80079-20-2 contains the test method to determine the specific electrical resistance of dust. Dust is divided into 3 sub-groups depending on this level of resistance:

IIIA – Combustible flyings

IIIB – Non-conductive combustible dust
specific electrical resistance > 10³ Ωm

IIIC – Conductive combustible dust
specific electrical resistance < 10³ Ωm

[6], [8]

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[11] ISSA Prevention Series No. 2057(E), Collection of Examples "Dust Explosion Protection for Machines and Equipment" Part 2, ISBN: 978-92-843-8185-7

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Cracks in normal strength concrete and mortar subjected to elevated temperatures
Viktor Hlavička, PhD
BUDAPEST UNIVERSITY
OF TECHNOLOGY AND ECONOMICS


CONTENTS
- Introduction
- Goals of the research
- Experimental program
- Results
- Conclusion

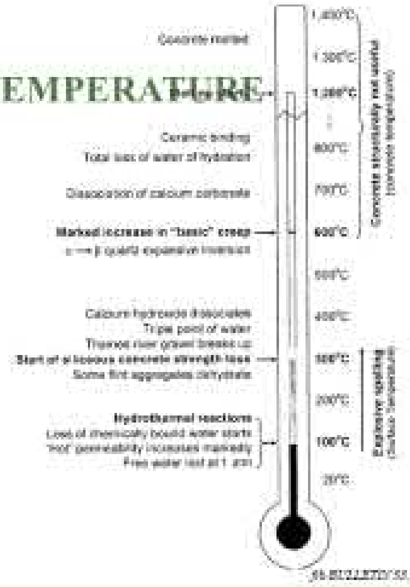
Introduction

Concrete at elevated temperature

Failure of concrete at high temperatures (fire loads) has two main origins:

- chemical changes in the components of concrete,
- spalling of concrete cover (surface layer).

Important physical and chemical changes in concrete subjected to high temperatures:



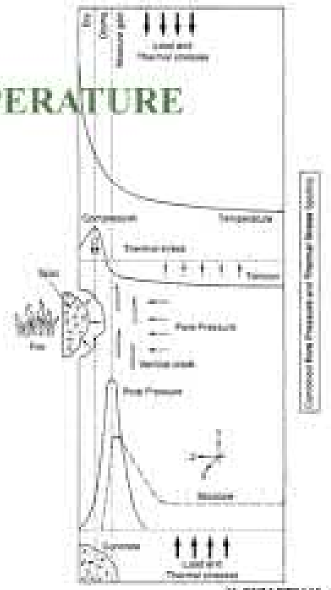
fib BULLETIN 38 (2007)

Introduction

Concrete at elevated temperature

Other source of concrete failure in case of fire is spalling, that has two main reasons:

1) increased pore pressure causes spalling of the surface layer of concrete.
2) the exposed zone cannot bear further stresses caused by heat expansion therefore it cracks and crushes.



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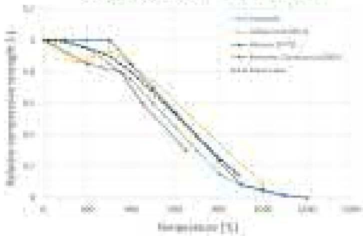
Introduction

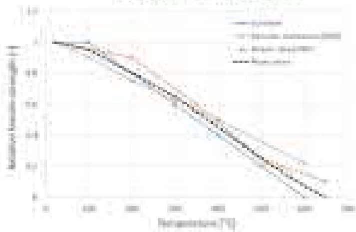
Concrete at elevated temperature

Due to the physical and chemical changes the strength properties of concrete also change:

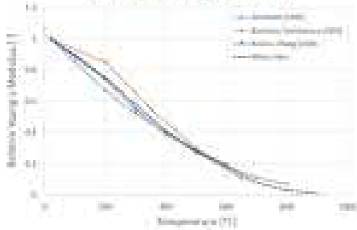
Compressive strength



Tensile strength



Young's Modulus



Hlavička V., Lublóy É. (2018)

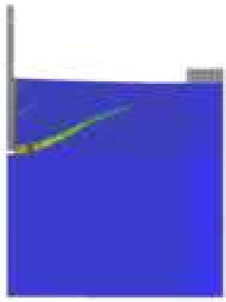
Introduction

Concrete at elevated temperature

Fracture energy of the thermally damaged concrete

Def.: „The fracture energy of concrete G_f [N/m], defined as the energy required to propagate a tensile crack of unit."

MC2010 (2013)



Application:

- Calculating the tensile capacity of anchors in concrete:

$$N_{u,c}^{0} = 2{,}1 \cdot \left(E_c \cdot G_f\right)^{0,5} \cdot h_{ef}^{3/2},$$ *Eligehausen and Sawade (1989)*

- Important parameter for finite element analyses

Goals of the research

- Understanding the properties of cracks and crack propagation in thermally damaged concrete.
- Provision of parameters for finite element and others calculations.

Experimental program

Mixtures → **Specimens** → (60 day) → **Thermal loading** → (cooling 24 h) → **Three-point bending test** → (½ prism) → **Compressive strength test**

Mixtures

Concrete: d_{max} = 8 mm

Mortar: d_{max} = 4 mm

Aggregate: quartz

Specimens

Prism: 7x7x25 cm

Σ = 2x36 = 72 pieces

Thermal loading

Electric furnace

Load steps: (20), 100, 200, 300, 400, 600, 800 °C

Three-point bending test

CMOD (crack mouth opening displacement) controlled

Measured:
- force,
- vertical displacement
- CMOD

Compressive strength test

Experimental program

Three-point bending test

Full length: 250 mm
Effective span: 200 mm
Initial notch depth: 12 mm
Specimen depth: 70 mm

Results

Fracture surfaces

Concrete:

20 °C | 100 °C | 200 °C | 300 °C | 400 °C | 600 °C | 800 °C

Mortar:

20 °C | 100 °C | 200 °C | 300 °C | 400 °C

Results

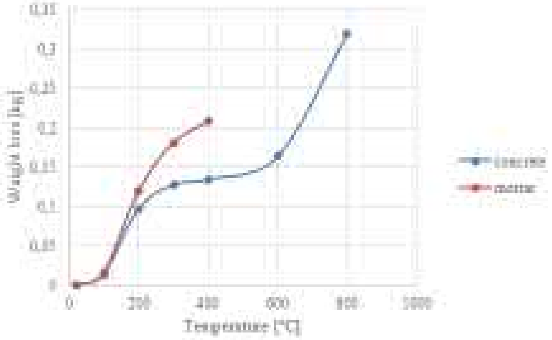
Spalling

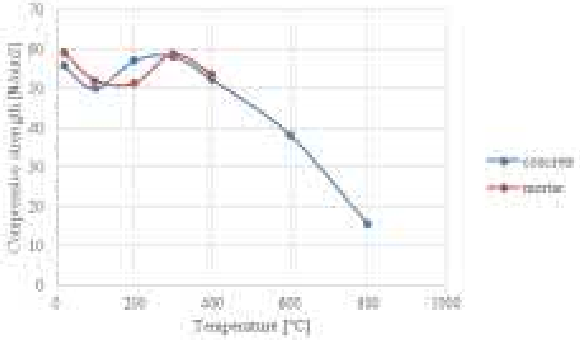
Mortar – 600 and 800 °C

Caused by high moisture content

Results

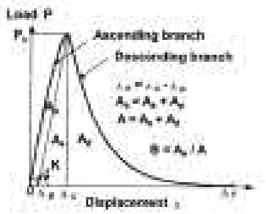
Weight loss and Compressive strength





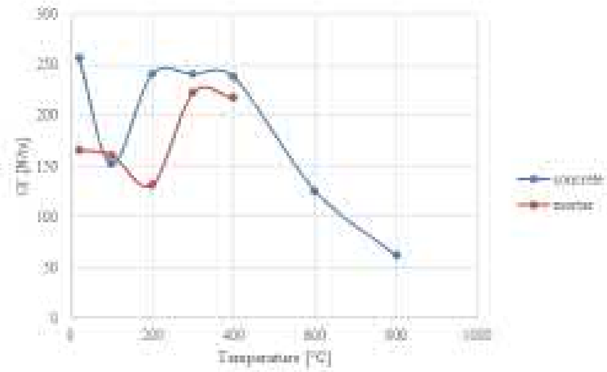
Results

Three-point bending test



$$G_F = \frac{\int_0^{\Delta_F} P(\Delta)\, d\Delta + m\,(1-\alpha_0)\, g\,(L/S)\,(2-L/S)\,\Delta_F}{B\,(H-a_0)}$$

Bicanic, N., and Zhang, B. (2002)



Conclusion

Investigation of the fracture surface shows that:

- above 300 °C the colour of quartz aggregate turns red,
- as the temperature increases, the number of cracked pieces of aggregate decreases, the crack propagates mostly in the cement phase,
- above 600 °C microcracks can be seen in the cement phase.

As the temperature rises, the weight loss increases.

In case of compressive strength, a local minimum can be observed between 100-200 °C and a local maximum between 200-300 °C. Above 300 °C, the compressive strength decreases rapidly.

In the case of fracture energy, a local minimum also forms around 100-200 °C. Then, in case of concrete, between 200-300 °C the fracture energy reaches the initial value, while in case of mortar it exceeds. In both cases, above 300 °C, the value of the fracture energy decreases rapidly.

Acknowledgement

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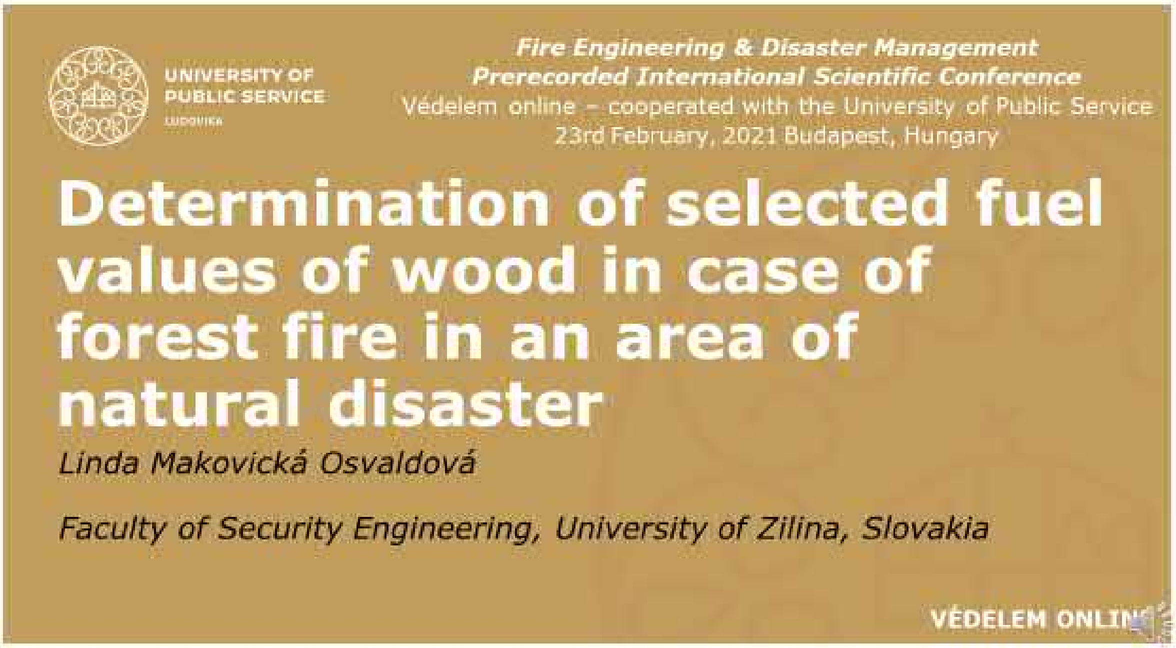
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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Determination of selected fuel values of wood in case of forest fire in an area of natural disaster
Linda Makovická Osvaldová
Faculty of Security Engineering, University of Zilina, Slovakia
VÉDELEM ONLINE


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She is a associate professor at the Department of Fire Engineering at the Faculty of Security Engineering. In her scientific and educational activities, she deals with the issues of testing of materials used in technological processes and in building constructions, as well as with natural materials in forest fires.
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Contents of the presentation

1. Forest fires
2. Experimental design
3. Evaluation and discussion

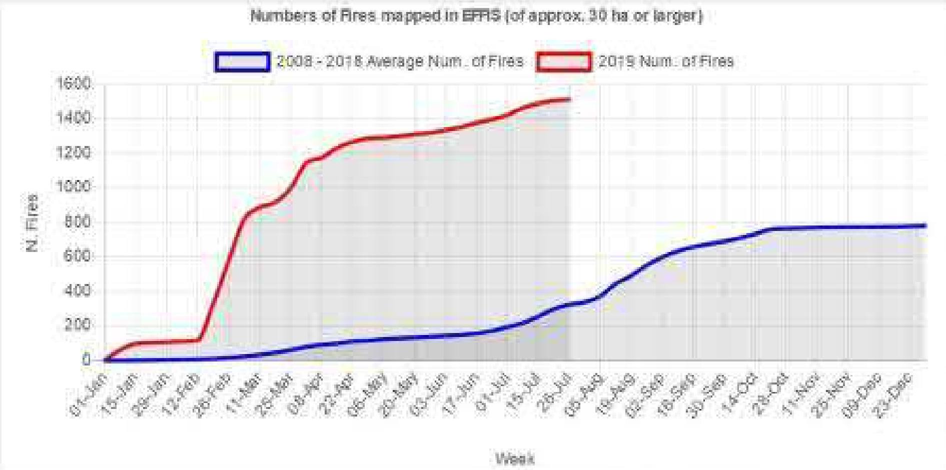
Forest fires

Forest fires are quite a common phenomenon, even on the European continent. Even if this phenomenon was quite rare in our territory in the past, it needs to be given close attention in the future. Fire-fighting requires great manpower and resources, in many cases on a long-term scale. The equipment, machinery and tactics of intervention units specializing in forest fire-fighting are always changing. Forest fire-fighting has become the subject of much research, and predictive scenarios for forest fire development are designed and tested.

Forest fires

The latest equipment, geographic information systems, knowledge of geomorphological and climate conditions, and meteorological conditions are all included in fire simulations. An important factor for such a simulation is knowing what kind of fuel naturally occurs in the area of the potential forest fire. The aims of our experiment is to compare methods of testing the fire characteristics and differences in fuel properties according to the position of the wood on the tree (branch, trunk and root) for various coniferous tree species (spruce, fir, pine and larch).To determine these characteristics, the test method, in particular the dimensions of the samples, had to be modified.

Forest fires



Forest fires recorded during the given time period according to EFFIS .

Forest fires

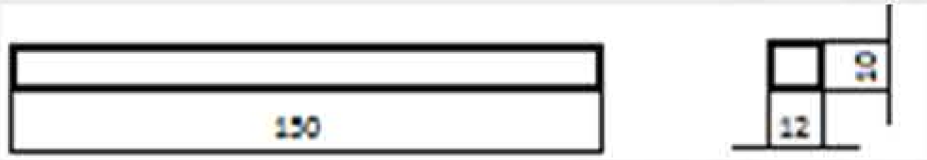
Forest fires in Slovakia in 2018 and 2019.

Location/year	Duration of fire (hours)	Area (ha)	Equipment/helicopter
Polomka/2018	92	7.5	56/2
Gader/2018	197	2.5	80/1
Bystrá-Gapeľ/2019	122	5.1	75/2
Blatnica-Ostrá/2019	27	0.05	12/1

Methods

Test specimens were prepared from 1 meter-long trunks of several types of trees (pine, fir, spruce, larch). After dressing the trunks by removing the bark and cutting it into boards, the boards were dried to a constant moisture of 8 % (± 2 %). The boards were then cut into test specimens of 10 mm x 12 mm x 150 mm. No surface finish was used for the test specimens. Specimens from branches and roots were cut in the same manner as the trunk. The diameter of both branches and roots was at least φ 60 mm at the thinner end. These were cut into boards and then into the test bodies.

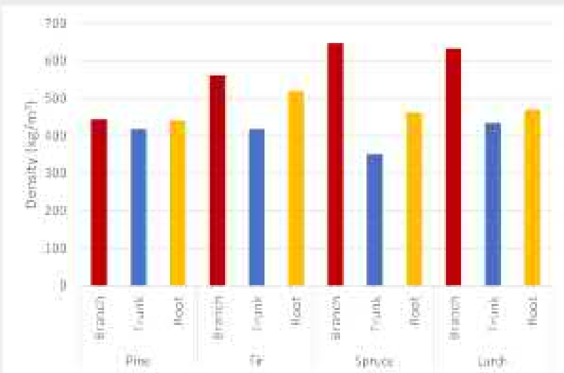
Methods



Dimensions of test specimens for the experiment

Methods

The foundational parameter was the density of the wood of the test bodies from the individual parts of the tree of the given tree species. The density changed even within the individual parts of the same tree. The humidity was regulated by air conditioning to the required level, so that it did not affect the evaluation criteria.



Average density of wood of the test bodies according to the type of wood and tree part.

Methods

The infrared heater was used as the radiant heat source. Heat transfer from the heater was carried out using the diffusion principle of electromagnetic radiation: a wavelength of 0,75 – 12 J/m is, when absorbed by a solid, transformed into heat. The radiator had the shape of a plane curved in the direction of the longitudinal axis of the body. Radiation was emitted by the front wall, the rear wall and the front edges. The side edges of the radiator were neglected because of their poor efficiency for the transfer of radiation. The radiator was made of special ceramic material, cordierite, which is very resistant to sudden temperature changes (temperature differences of more than 70 °C) and to high temperatures (up to 1100 °C).

Methods

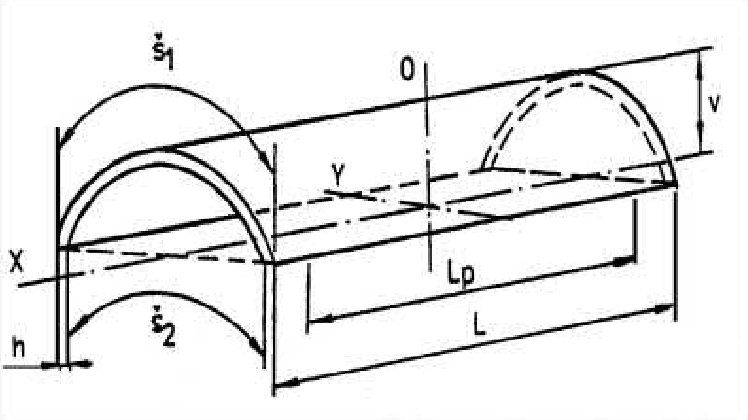


Diagram of the radiator

Methods

Weight loss was recorded while the sample was exposed to the radiant heat source. Relative weight loss was calculated according to this relation.

$$\delta_m(\tau) = \frac{\Delta m}{m(\tau)} . 100 = \frac{m(\tau) - m(\tau + \Delta\tau)}{m(\tau)} . 100 \ (\%)$$

where:

$\delta_m(\tau)$	– relative weight loss over time (τ) (%)
$m(\tau)$	– sample weight over time (τ) (g)
$m(\tau+\Delta\tau)$	– weight of the sample over time (τ + Δτ) (g)
Δm	– weight difference (g)

Methods

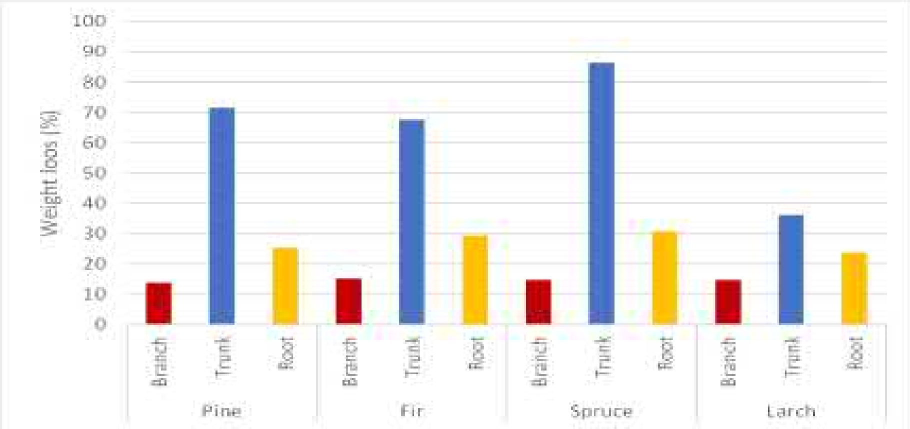
Relative burning rate was determined according to the function (2) or numerically (3):

$$v_r = \left|\frac{\partial \delta_m}{\partial \tau}\right| \quad (2), \qquad v_r = \frac{|\delta_m(\tau) - \delta_m(\tau + \Delta\tau)|}{\Delta\tau} \quad (\%/s) \qquad (3)$$

where:

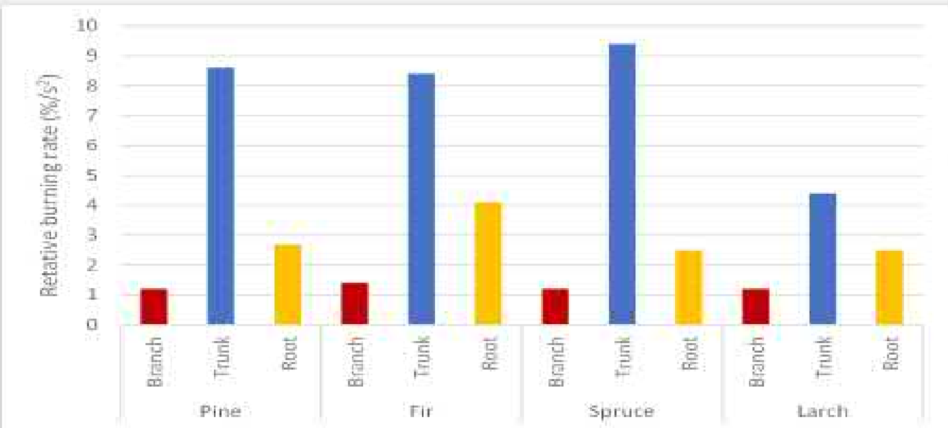
v_r	– relative burning rate (%/s)
$\delta_m(\tau)$	– relative weight loss over time (τ) (%)
$\delta_m(\tau+\Delta\tau)$	– relative weight loss over time (τ + Δτ) (%)
$\Delta\tau$	– time interval where the weights are subtracted (s)

Results



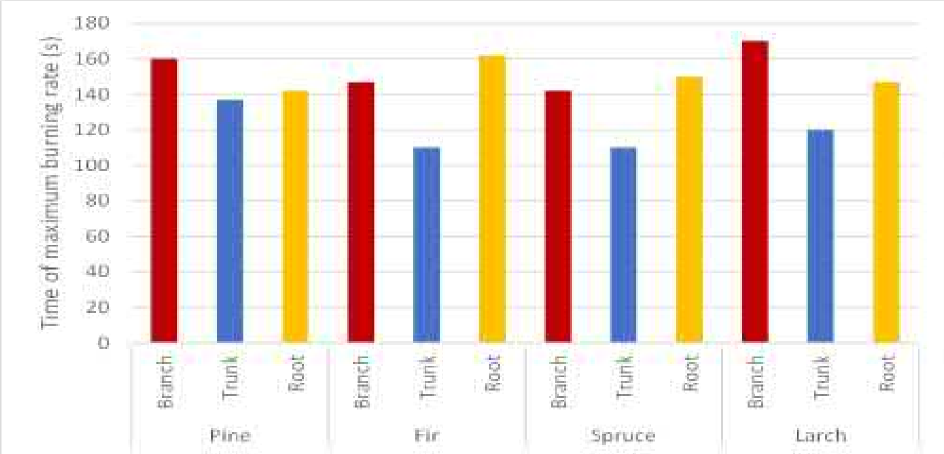
Average weight loos of wood of the test bodies according to the tree species and the tree part.

Results



Average relative burning rate of wood of the test bodies according to the tree species and the tree part.

Results



Average time of maximum burning rate of wood of the test bodies according to the tree species and the tree part.

Conclusion

This experiment confirmed that there is a difference in the behavior of wood, which is given both by the wood itself and by the position on the tree. It is given that the experiment was carried out under "sterile" conditions – environment, moisture, dimensions - which do not correspond to the real conditions of a calamity-hit area but were necessary for the accurate measurement of the monitored variables. The results can be used in simulations of forest fire development, combining knowledge of the presence of different wood in the simulated fire area with information on the fire characteristics of such wood, both according to the species of tree and the position of the wood in the trees.

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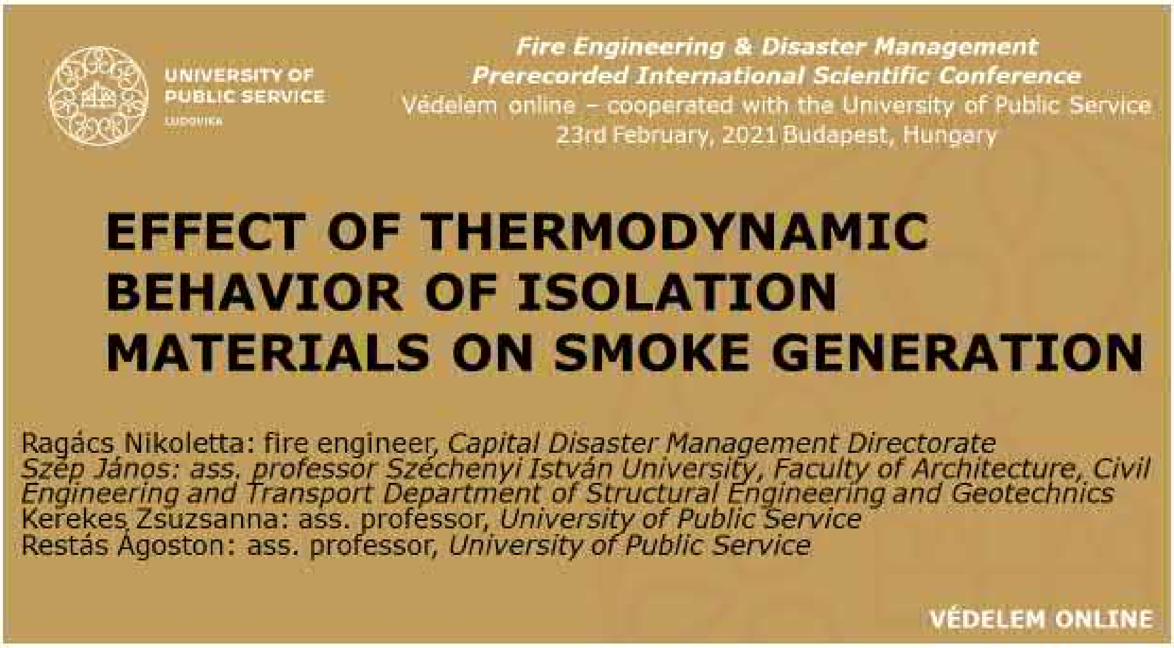
Nikoletta Ragács – Zsuzsanna Kerekes - János Szép – Ágoston Restás: *Effect of Thermodynamic Behavior of Isolation Materials on smoke generation*



Structure:

1. Abstract
2. Introduction of the presentation
3. Insulating test material samples
4. Test methods
5. Test results
6. Discussion, Conclusion
7. References

1. Abstract

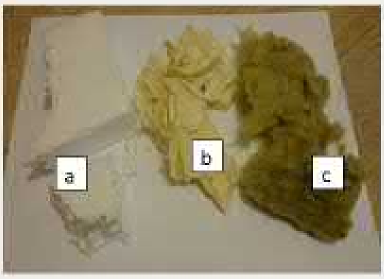
In our work, we investigated the thermodynamic nature of three insulating materials as a function of temperature and time. The thermoanalytical analysis is performed by thermogravimetry, differential thermal analysis, and mass spectrometry with evolving gas analysis [1]. The aim of the test is to determine the change in a selected material before the appearance of flame. In thermal analysis, the study of the change in mass and enthalpy of selected samples as a function of temperature and during the heating of materials over a time interval and the evolution of gases. The results of thermoanalytical studies show in advance how a material can behave, what changes take place as under fire. The decomposition process and temperature provide information on the appearance of the expected toxic gases. There is a relationship between smoke generating ability and thermodynamic properties, they still contain combustible material.

2. Introduction of the presentation

The requirement for insulation materials used in buildings is not only energy efficiency but also their environmental impact [2][3] [4]. The latter is not yet regulated by law. Directive 2002/91 / EC on the energy performance of buildings (in particular insulation, air conditioning and the use of renewable energy sources) included a method for calculating the energy performance of buildings, minimum requirements for new and existing buildings and energy performance certificates. Reducing energy consumption and using energy from renewable sources is also important to reduce greenhouse gas emissions [5].

3. Insulating test material samples

For the study, we selected three insulation material samples that would be the most widely used commercially available in the construction industry.



a. / Polystyrene foam insulation;

b. /Polyurethane foam insulation;

c. / Rock wool insulation.

[6][7][8]

4. Test methods

Thermal analysis (TG / DTA-MS), in which the change in the mass of the insulation materials as a function of temperature was examined, the study was supplemented by the analysis of the evolved gases during decomposition

Thermodynamic test (TG / DTA-MS)

Equipment: TA Instruments SDT 2960 type simultaneous TG / DTA instrument was used, by the Balzers Instruments Thermostar GSD 300T quadrupole ion detector mass spectrometer and the associated developing gas analyser (MS) were used for the evolution gas analysis [9].

.- The evaluation of the curves was performed for TA Instruments SDT 2960 simultaneous TG / DTA instrument with TA Instruments Universal Analysis Thermal Solutions Release 2.3, and for Balzers Instruments Thermostar GSD 300T mass spectrometer with Quadstar 422 program.
- Location of measurements and equipment: at the Department of Inorganic and Analytical Chemistry, Faculty of Chemical Engineering, Budapest University of Technology and Economics

5. Test Result Thermodynamic tests (TG / DTA-MS)

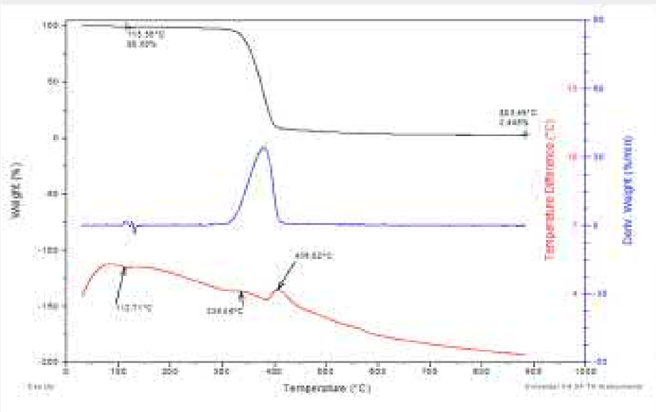
In the following, the TG / DTG / DTA results are displayed in the form of a line chart in three colours:

- the change in the weight of the sample, the decrease in weight percentage is shown by the **black** curve (TG);

- the rate of change of mass of the sample is shown by the **blue** curve (DTG);

- the temperature difference between the sample and the reference is shown by the **red** curve (DTA);

5.1 Results of TG / DTG / DTA and gas analysis (MS) of expanded polystyrene



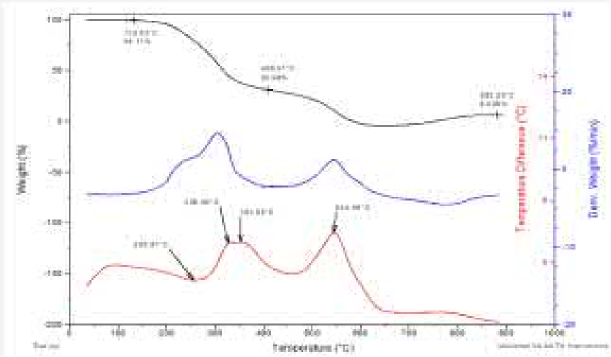
Maximum mass loss: 350 degrees Celsius and 400 degrees Celsius main provinces:

I. First stage of decomposition below 116 degrees C: physically absorbed water was removed, which can be seen on the DTA curve at the endothermic peak of 112.7 ° C.

II. 300 ° C to 400 ° C: carbon dioxide (CO ++, 44 m / z), water (H2O +, 18 m / z) and various organic fragments evolved (CH2 +, 14 m / z; C2H3 +, 27 m / z) C4H9 +, 57 m / z, C6H5 +, 77 m / z).

III. At 334.5 ° C and 406.6 ° C, exothermic peaks are seen, indicating that the sample was burne

5.2 Results of TG / DTG / DTA and gas analysis (MS) of polyurethane foam

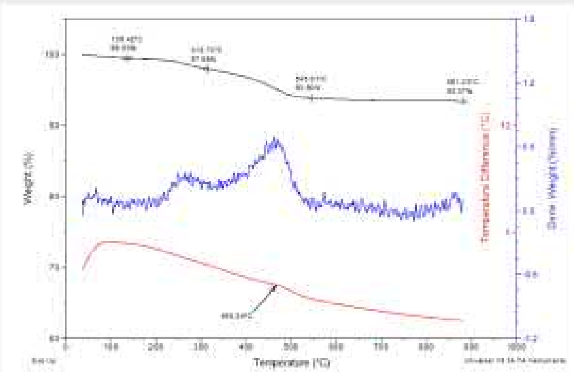


Main features Maximum weight loss: 94%, between 130 and 600 degrees Celsius

Endothermic (255.9 ° C) and two sharp exothermic peaks (327.8 and 353.5 ° C) .

Detectable gas components: initially carbon dioxide (CO ++, 14 m / z), water (H2O +, 18 m / z), organic fragment (CH2 +, 14 m / z; NH +, 15 m / z; C2H3 +, 27 m / z) z; CO +, 28 m / z; C4H9 +, 57 m / z; NHCO2 +, 59 m / z; C6H5 +, 77 m / z)

5.3 Results of rock cotton TG / DTG / DTA and gas analysis (MS)



Main characteristics:

Maximum mass loss: 6.6% between 130 and 900 degrees Celsius,

There is no sharp protruding exothermic peak, ie the raw material is thermodynamically stable,

I. The water adsorbed in the first stage of decomposition leaves the sample below 136 ° C.

II. Carbon dioxide (CO ++, 14 m / z), water (H2O +, 18 m / z) and other organic ions (CH2 +, 14 m / z; C2H3 +, 27 m / z; CO +, 28 m / z) . (5)

6. Discussion, Conclusion

The thermodynamic properties of two polymers and one silicate fiber insulation material were investigated Characteristics of physical and chemical changes in insulation materials exposed to a direct heat source Phases of inflammation:

1. water loss (loss of free, bound water content);

2. surface discoloration (brown and then black discoloration, glow)

3. charring (formation and combustion of gases required for combustion, formation of charcoal); Melting: EPS lost its solid state in the present study. During the test, the phases of inflammation cannot be declared.

Test Material	Physical change	Physical lesion type	Physical lesion type	Physical lesion type	With flame burn (Yes /No)	Smoke generation (Yes / No)
EPS	< 90 C°	melting	<250 C°	complete loss of stability	no	no
Pur	<100C°	Surface discoloratio glow	<300 C°	surface charring	no	yes
Rockwool	>246 C°	surface discoloration, glow	-	-	yes	yes

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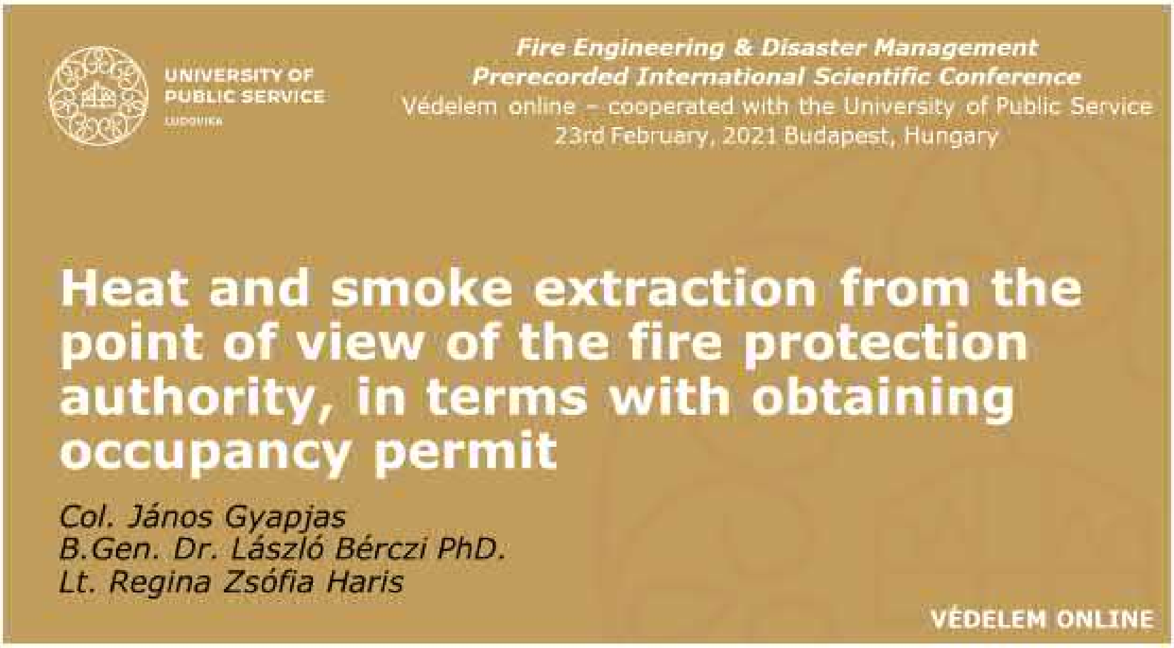
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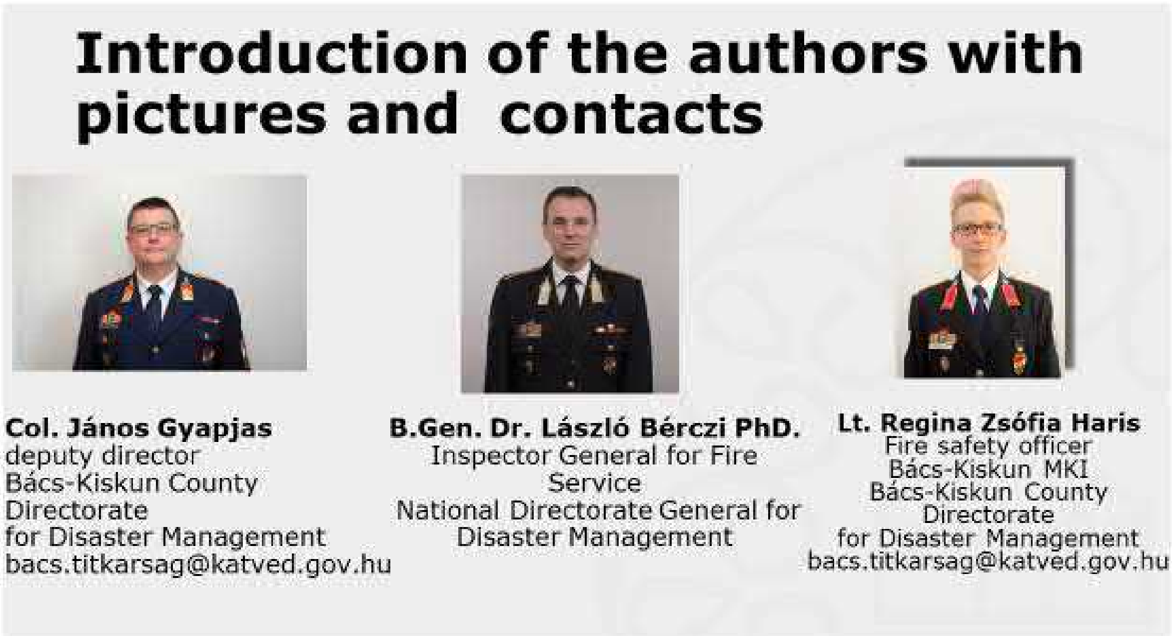
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Structure:

- INTRODUCTION TO THE TOPIC
- METHOD
- REGULATION
- NODES
- RESULTS
- SUMMARY, SUGGESTIONS

Abstract

Ensuring proper heat and smoke extraction is very important in fire protection. Its significance is also emphasized by earlier fire events. According to our hypothesis, the prevalence of certain sub-areas of heat and smoke extraction is not optimal. Construction is such a sub-area, therefore in our study we mainly deal with implementation. This can be improved by identifying connection network, methods, typical and recurrent insufficiencies, and making targeted suggestions. Relevant on-site experience is gained by the fire prevention authority, therefore this perspective was chosen in our study. We consider the construction of heat and smoke to be problematic, so greater emphasis is put on occupancy permit inspections. Our research methods were focus group interviews, questionnaires, and the analysis of documentation and regulation. Nodes were identified and a model of occupancy permit inspections was set up. The general situation assessment gradually declines from design through construction to operation. The safety awareness of investors and operators is considered to be low, and the problems experienced during construction and operation are considered to be relatively common. We identified 8 typical problems in the design phase and 10 in the construction phase. We present a complex solution plan. Based on the results, we recommend continuing the research, using it for educational purposes, and for the reviewing of regulations.

What should be our common goal?

The building should be:
- nice, interesting,
- cheap,
- useful,
- ready on time,
-...

It can be used safely as intended.

FIRE PROTECTION

OTSZ | TvMI

[2]-[8]

Introduction of The Presentation

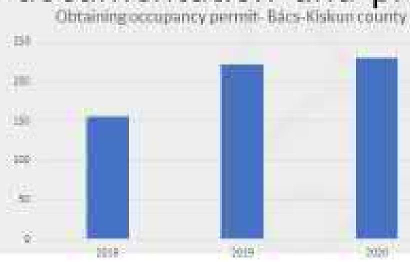
Fire in Miskolc 2009 [9]

Fire in Debrecen 2007 [10]

[11]

Methods

- Focus group interviews - 4 official head of fire prevention department and 4 civil fire experts
- Questionnaire - 90% of Bács-Kiskun County Fire Protection Authority Experts / 50% of Bács-Kiskun County Chamber of Engineers Fire Protection Section
- Regulatory examination
- Examination of documentation and procedures

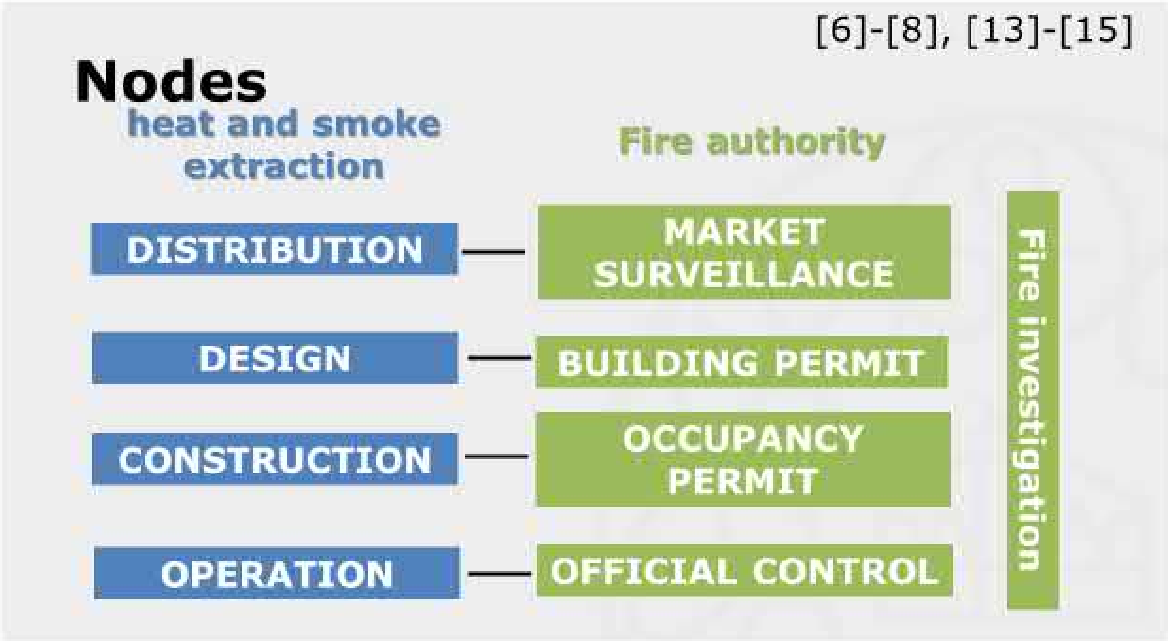


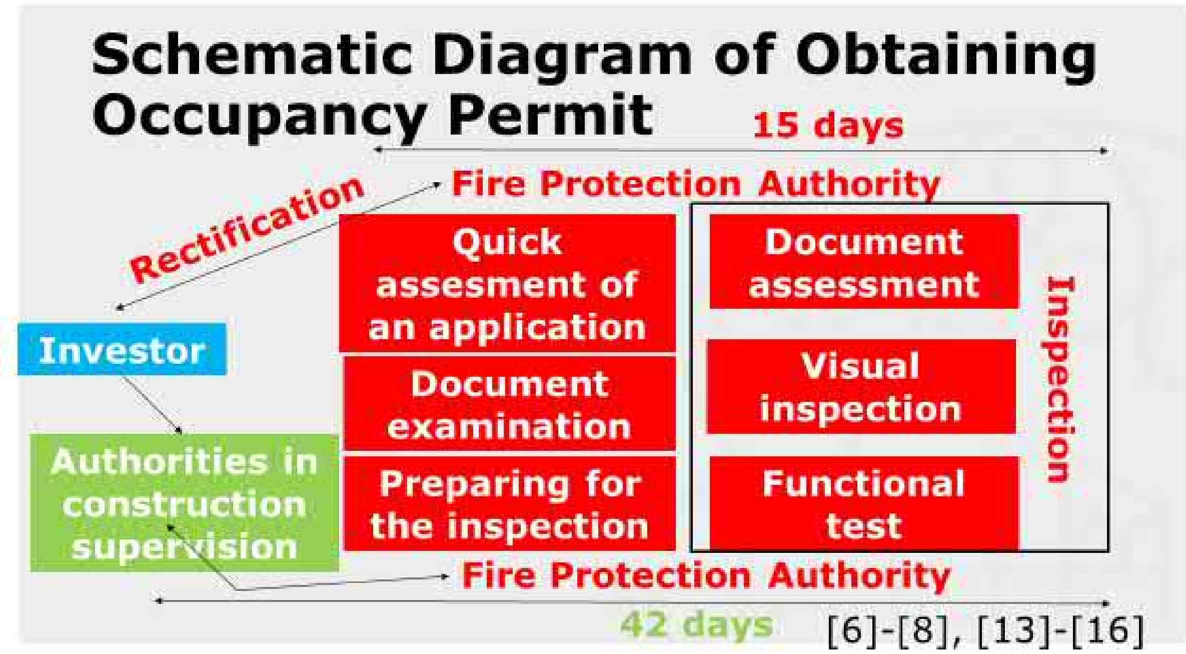
[12]

Regulation

[6]-[8], [13]-[15]

Fire Protection Act	The framework legislation on fire protection.
National Fire Protection Regulations	Contains the expected level of security.
Fire protection technical guidelines	Contains acceptable technical solutions.
Harmonized standard	For example, MSZ EN 12101
Manufacturer's specifications	Applies to a specific product.
Authority's own regulators	It basically applies to the authority. Uniform rules of public proceedings.


[6]-[8], [13]-[15]
Nodes
heat and smoke extraction
Fire authority
DISTRIBUTION
MARKET SURVEILLANCE
DESIGN
BUILDING PERMIT
CONSTRUCTION
OCCUPANCY PERMIT
OPERATION
OFFICIAL CONTROL
Fire investigation


Schematic Diagram of Obtaining Occupancy Permit
15 days
Fire Protection Authority
Rectification
Quick assesment of an application
Document examination
Preparing for the inspection
Document assessment
Visual inspection
Functional test
Inspection
Investor
Authorities in construction supervision
Fire Protection Authority
42 days
[6]-[8], [13]-[16]

How optimal is the overall situation?

Based on the answers to the questionnaire, the general situation of heat and smoke extraction:

- more positive in planning;
- rather negative during construction;
- definitely negative during operation.

According to the responses, investors and operators have low fire safety awareness.

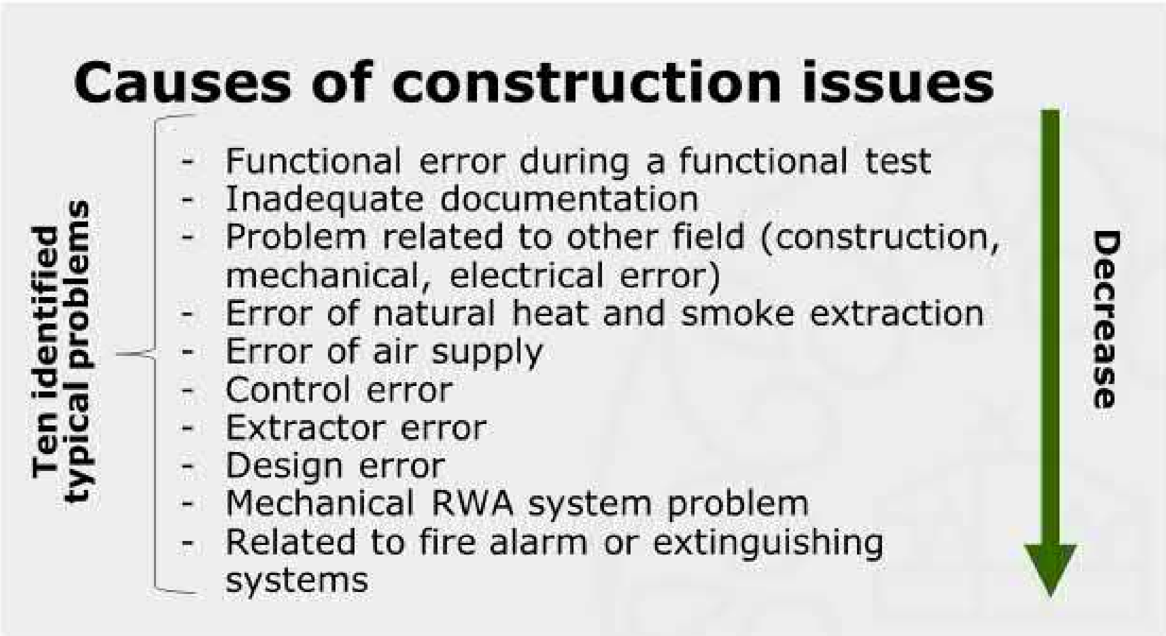
Occurrence of Issues

How many of heat and smoke extraction issues can be traced back to planning insufficiencies out of 10 cases?
The majority of responses say less than five out of ten.

How often do you experience a CONSTRUCTION problem with heat and smoke extraction?
70% of the respondents said occurrence was five out of ten cases.

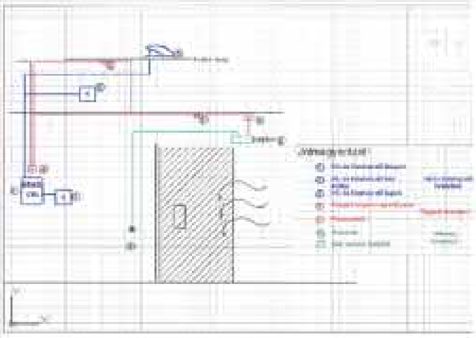
How often do you experience heat and smoke extraction problems during the OPERATION of buildings?
One-fifth of the respondents said at least 8 out of ten cases.


Typical design issues
Five typical problems were identified
Location / arrangement of device, appliance
Size / separation of smoke sections
Provision of air supply
Control
Electric power supply
Decrease


Causes of construction issues
Ten identified typical problems
- Functional error during a functional test
- Inadequate documentation
- Problem related to other field (construction, mechanical, electrical error)
- Error of natural heat and smoke extraction
- Error of air supply
- Control error
- Extractor error
- Design error
- Mechanical RWA system problem
- Related to fire alarm or extinguishing systems
Decrease

Recommendations of Proper Routine

- A model of technical documentation and a shematic drawing were released in The Heat and Smoke Removal Directive
- The application of such documents and drawing was used in an authorization process of a major investment, and the model was added to the Directive by our proposal.
- Based on the results of the questionnaire, the model is rarely used, although its application could effectively help in the authorization of the building.



Example of a correlation drawing

[8]

Discussion, Conclusion 1.

- **The fire protection authority takes action to rectify the identified insufficiencies in every case.**
- **Procedural nodes**
- **Model of obtaining occupancy permit**
- **5 design and 10 constructional errors**
- **Continuing research (focusing on operation!)**
- **Assesment of quality of cooperation with other fields (architectural, mechanical, electrical engineering etc.)**

Discussion, Conclusion 2.

- **Providing support documents and checklist for designers**
- **Greater emphasis on pre-inspection operational tests**
- **Thematic trainings for authority personnel and engineers, and propagation of appropriate practices**
- **Raising the awareness of investors and operators to fire safety**

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
FIRE RESISTANCE TEST OF SELF-SUPPORTING DOUBLE SKIN METAL FACED SANDWICH PANELS
Komlai Krisztina: testing engineer, ÉMI Non-profit LLC.
Kerekes Zsuzsanna: ass. professor, University of Public Service
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Structure:

1. Abstract
2. Introduction of the presentation
3. Test specimens and their properties
4. Test methods
5. Test results
6. Discussion, Conclusion
7. References

1. Abstract

Nowadays, the use of sandwich panels is a very common construction technology. These construction products are composite panels with metal faces on the outside and an internal insulating core between them.

Sandwich panels are often used in the construction of halls, warehouses and other industrial buildings due to their easy installation and short construction time.

Their advantages include the availability of panels of different types, thicknesses and colours on the market, which provide freedom of choice according to different aesthetic, functional and technical requirements.

In addition, it is important to pay attention to fires affecting sandwich panels, the properties of which depend on the material of the core, the method of installation and the quality of construction. [1][2][3]

2. Introduction of the presentation

Fire protection requirements for buildings and structures are laid down in the legislation of different countries.
In order to be able to test and compare the previously mentioned wide range of products along the same technical parameters, it is essential to apply the appropriate technical standards.
In our fire testing laboratory, we deal with real-scale fire resistance tests, during which we have the opportunity to observe the behavior of metal faced sandwich panels.

Fig. 1 Non-loadbearing sandwich panel wall [4]

3. Test specimens and their properties

Fig 2. The 1st specimen

- 100 mm thick sandwich panel with PIR foam thermal insulation core
- Wall panels in vertical orientation acc. to MSZ EN 14509:2014

- 100 mm thick sandwich panel with PIR foam thermal insulation core
- Wall panels in horizontal orientation acc. to MSZ EN 14509:2014

Fig 3. The 2nd specimen

Fig 4. The 3rd specimen

- 80 mm thick sandwich panel with graphite urethane foam thermal insulation core
- Wall panels in vertical orientation acc. to MSZ EN 14509:2014

4. Test methods

- The test method for determining the fire resistance of non-loadbearing walls is specified in standard MSZ EN 1364-1.
- Dimension of test specimen: at least 3×3 m, built into a metal test frame
- The test specimen is exposed to a standard fire during the test [7]
- Parameters measured during the test:
  - Average temperature rise ≤ 140 K
  - Maximum temperature rise ≤ 180 K
  - Horizontal deformation of wall
- Resistance to fire performance characteristic:
  - E – Integrity: Is the ability of the separating construction to prevent transmission of fire by passage of flames or hot gases
  - I – Insulation: Is the ability of the separating construction to prevent transmission of fire by transfer or radiant heat [8][9]

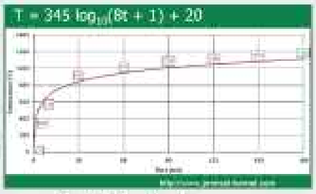

Fig. 5 Standard fire curve

Fig. 6 Vertical furnace

5.1 Test results of 1st specimen

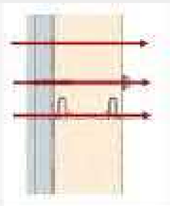

Fig. 7 Heat transport [10]

Heat transport may occur:

- along the panel
- along the screw
- along the joint

Test specimen:

- vertical orientation
- fastening of sandwich panels to each other: self-tapping screw and washer per 300 mm
- joints: no sealing material
- the largest measured deformation: 74 mm
- 34th min.: two thermocouples (at mid height, at the junction of vertical joints) maximum surface temperature rise exceeded 180 K
- fire resistance classification: EI 30

Fig 8. Horizontal deformation of the wall, during the test

5.2 Test results of 2^{nd} specimen

Fig 9. Test specimen, during the test

Test specimen:

- horizontal orientation
- fastening of sandwich panlels to each other: self-tapping screw and washer per 300 mm
- joints: no sealing material
- the largest measured deformation: 57 mm
- 25^{th} min.: a thermocouple (at the junction of horizontal joints) maximum surface temperature rise exceeded 180 K
- fire resistance classification: EI 20

Note: EGOLF Recommendation 028-2018

Disregarding unexposed thermocouples

Fig 10. Test specimen, after the test

5.3 Test results of 3^{rd} specimen

Fig 11. Test specimen, before the test

Test specimen:

- vertical orientation
- fastening of sandwich panels to each other: self-tapping screw per 80 mm
- 31^{th} min.: a thermocouple maximum surface temperature rise exceeded 180 K
- expected fire resistance classification: EI 60
- real fire resistance classification: EI 30

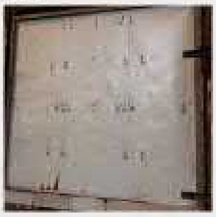

Fig 12. Test specimen, during the test

Fig 13. Test specimen, after the test

Fig 14. Test specimen, after the test

6. Discussion, Conclusion

Although the extension standard for sandwich panels [11] deals in detail with the chemical and physical properties of the materials used in the panel and specifically addresses the horizontal and vertical installation methods, I think it is worth placing more emphasis on and communicating the manufacturer's specifications, accuracy and professionalism towards partners.

It is important to pay attention to the installation errors during the preparation of the test, which can shorten the expected fire resistance result by minutes.

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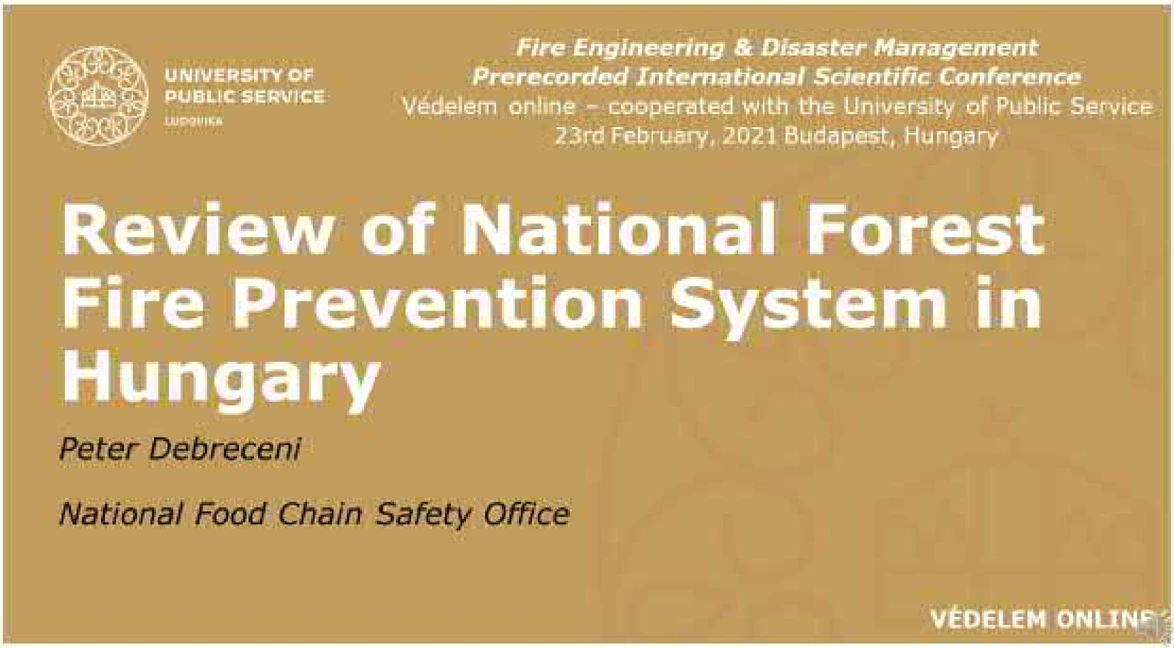
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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Review of National Forest Fire Prevention System in Hungary
Peter Debreceni
National Food Chain Safety Office
VÉDELEM ONLINE


Introduction
Name: Peter Debreceni
Affiliation: National Food Chain Safety Office (as forest authority)
E-mail: DebreceniP@nebih.gov.hu
Speciality:
- design and analysis of forest fire database
- operation and development of fire ban system
- preparing forest fire prevention plans
Member of EU Commission Expert Group of Forest Fire
Award: Bronze medal for volunteer support of Disaster Managent by Minister of Interior

Contents of the presentation

Abstract

The forest fire prevention activity is implemented in cooperation with the forestry authority and disaster management. Data collection and analysis of wildfires carried out, periods of high fire risk are determined and a fire ban is announced within the framework of the Forest Fire Information System. Based on the fire hazard classification of forest areas, forest fire protection plans are prepared and updated by authorities and forest managers. Providing appropriate information on forest fire for citizens is a core element of forest fire prevention. A communication plan has been prepared to organize communication actions and awareness raising campaigns. In this short study I would like to outline the structure of the forest fire prevention system in Hungary and to identify that topics where development and the incorporation of innovative techniques are needed.

[1] [2] [3]

Methods

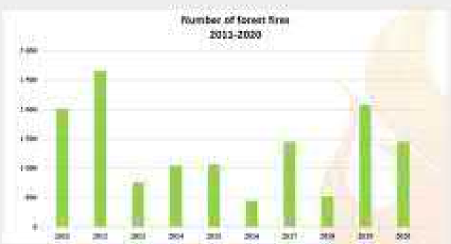
Studying of the forest fire prevention system and preparing an issue

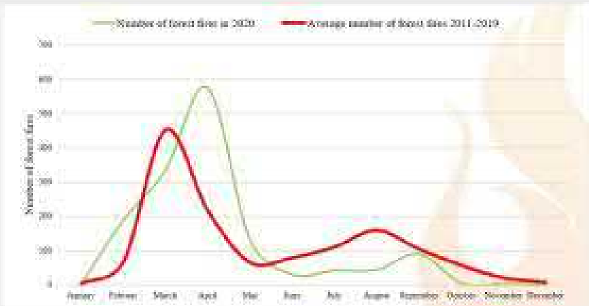
Evaluation of statistical data

Short report with fire fighters and forest managers

Studying relevant guidelines and literature

Results I.





Evaluation of data gathering system

- Number of fires and burned area should be comparable in consecutive years

- To separate the two different fire season during the year

- To define high danger days

[4] [5] [6]

Results II.

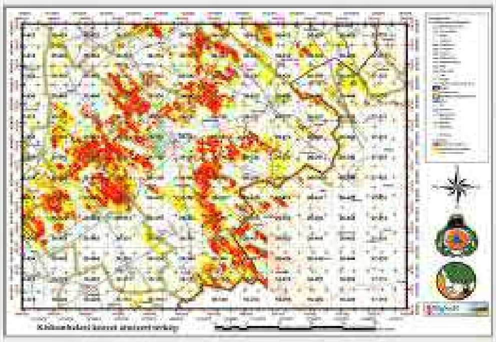
Fire ban system

- Evaluating of fire danger day by day based on Fire Weather Index developed by Joint Research Center

- To define high danger areas within counties

[5] [6]

Results III.



Fire hazard classification of forest stands

- Preparing classification method of non forest areas

[5] [6]

Results IV.

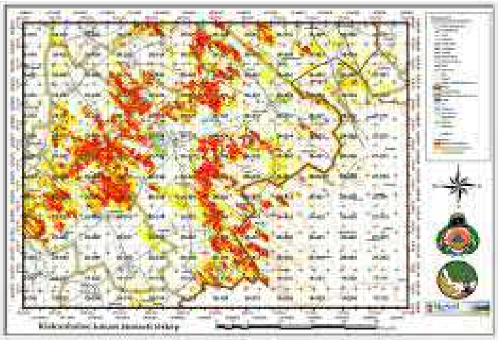
Review of content of forest fire prevention plans on all levels
- Country
- County
- Local (forest manager)béllll

Implemantation of core principles for the development of fire management plans (FMP) based on current fire and forest policy and relevant science information.

Consistent and compatible, Collaborative, Clear and comprehensive, Spatially and temporally scalable, Informed by best available science

[5] [6]

Results IV.



Forest maps for Fire Brigades

Optional layers by authorized users

Printable views

Different types of thematics on forest layer (fire hazard, natural conservation categories, tree species, etc.)

Contents of descriptive database
- Adresses of forest managers
- Details for fire prevention and suppression of forest subcompartments
- Adresses of regional forestry authorities

[5] [6]

Results V.

Fire prevention activities and fire information campaign

The European Green Deal Communication adopted in December 2019 by the European Commission announces a new EU forest strategy for 2021.

Based on EU Commission strategy suggested to renew the information campaign to aim an effective, proactive and continuous forest fire prevention activity.

To extend the range of available communication channels and better reach the specified target groups.

[5] [6]

Discussion

The need for more sophisticated approaches to wildfire management is becoming increasingly recognized by fire protection agencies in Hungary also.

We need to analyze and revise our fire management services, goals and processes and to implement new approachies used new results of science.

[7] [9]

Conclusion

Valuable assistance and decision support tools can be provided to local authorities responsible for wildfire management to extract useful information as part of an operational wildfire prevention and management plan.

We need to use the results of science to revise and develop our forest fire prevention system.

[8] [10] [11]

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南京理工大学
NANJING UNIVERSITY OF SCIENCE & TECHNOLOGY
Topic: Advances in Assessment Methods for Fire Safety
Co-Authors: Prof. Qiang Xu
Prof. Mikael Hedenqvist
Prof. Filippo Berto
Dr. Jiang Lin
Presented by Rhoda Afriyie Mensah
1


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NANJING UNIVERSITY OF SCIENCE & TECHNOLOGY
Content
Introduction
Flammability
Flammability Parameters
Fire Experiments
Oxygen Consumption Calorimetry
Conclusion
2

01 Introduction

A typical fire outbreak in London, 2017 (www.bbc.co.uk)

3

01

❑ Identify the source of the heat (ignition source)

❑ Analyse the materials used for the construction.

❑ For material analysis, we consider

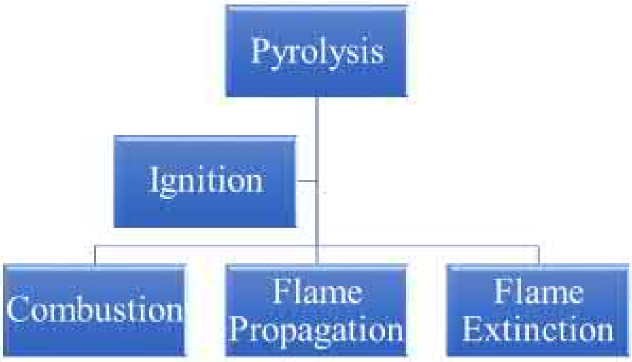
- Material composition and structure
- Physical properties
- Thermal properties (flammability)

4

02 Flammability

Characterizes the burning behavior of a material

Burning processes include;



5

03 Flammability Parameters

Heat Release Rate (HRR)	Heat Release Capacity (HRC)	Heat of Combustion (HOC)
Ignition Time (t_{ig})	Peak Heat Release Temperature (T_{max})	Fire Growth Capacity (FGC)

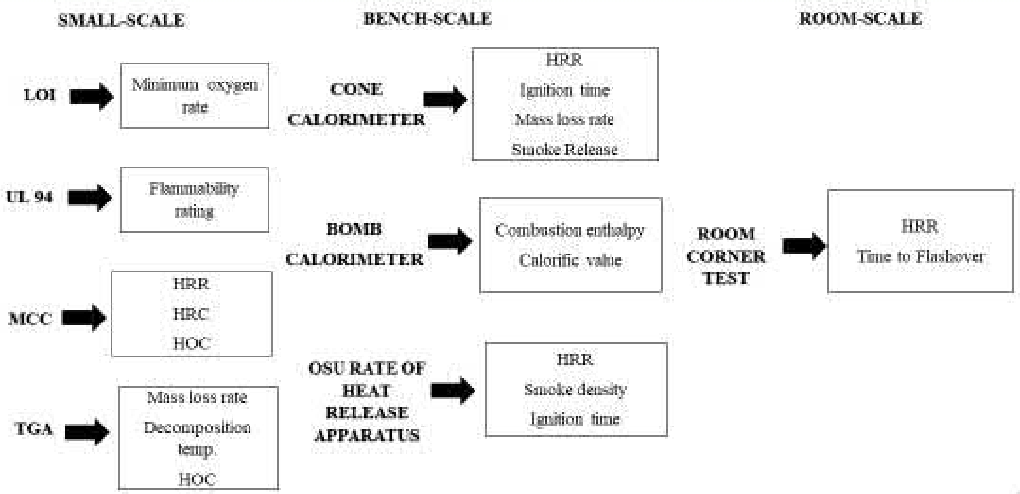
6

04 Fire Experiments

- ❑ Fire experiments measure the flammability characteristics of materials.
- ❑ The experiments are grouped into small-scale, bench-scale, room-scale experiments
- Small scale – milligram samples
- Bench scale – gram to kilogram samples
- Room/large scale – kilogram to metric tonnes
- ❑ Test protocols from ASTM, ISO etc. are available for consistency and accuracy.

7

04 Fire Experiments



8

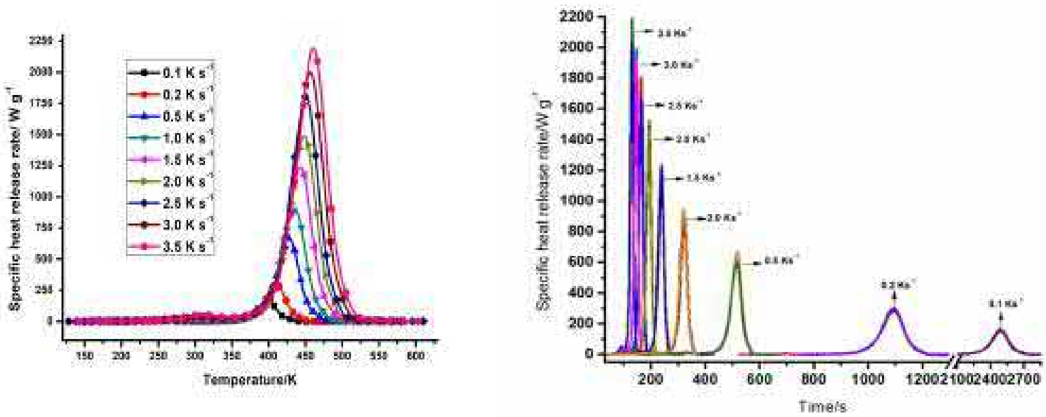
04 Oxygen Consumption Calorimetry/Oxygen Depletion Method

- The theory was formulated by Thornton in 1917.
- Clayton Hugget further developed the theory to include organic solids.
- The heat release rate of a material is estimated from the amount of oxygen consumed during the burning process.
- The average heat released per unit mass of oxygen has a mean value of 13.1 ± 5 $MJ\ kg^{-1}$.

$$Q(t) = \frac{E\rho_{o_2}}{m_0}\left\{F_0 X_{o_2}^0 - F X_{o_2}\left[1 - \frac{1}{3}\left(X_{o_2}^0 - X_{o_2}\right)\right]\right\}$$

04 Fire Experiments

04 Typical MCC Results



Plots of specific HRR versus Time/Temperature

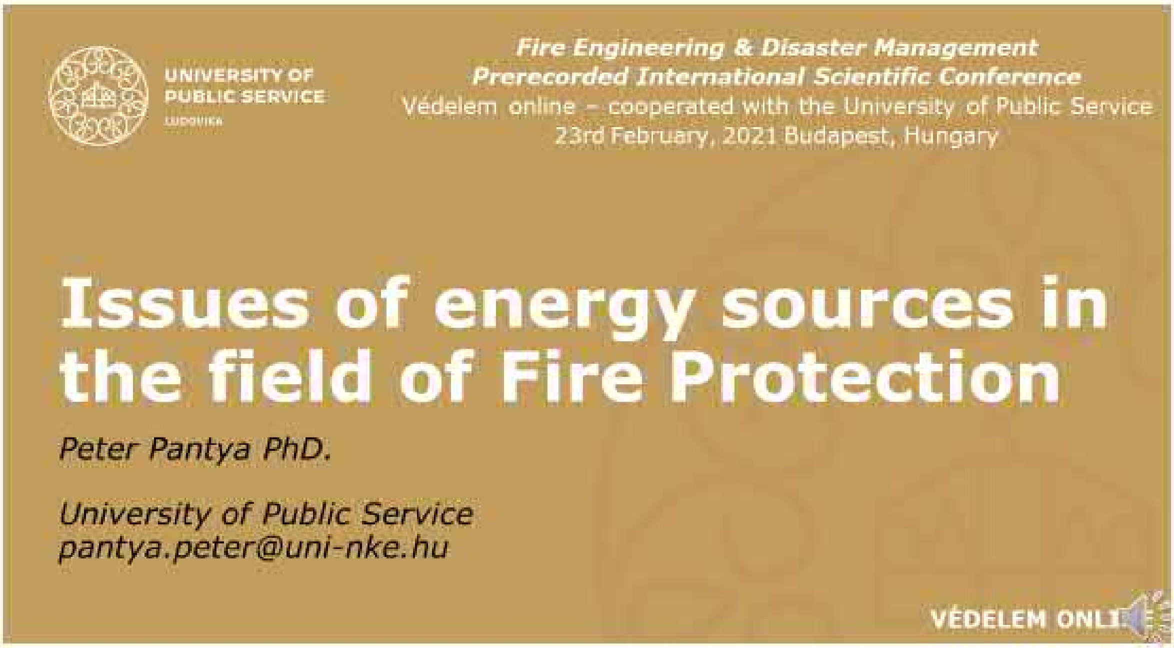
11

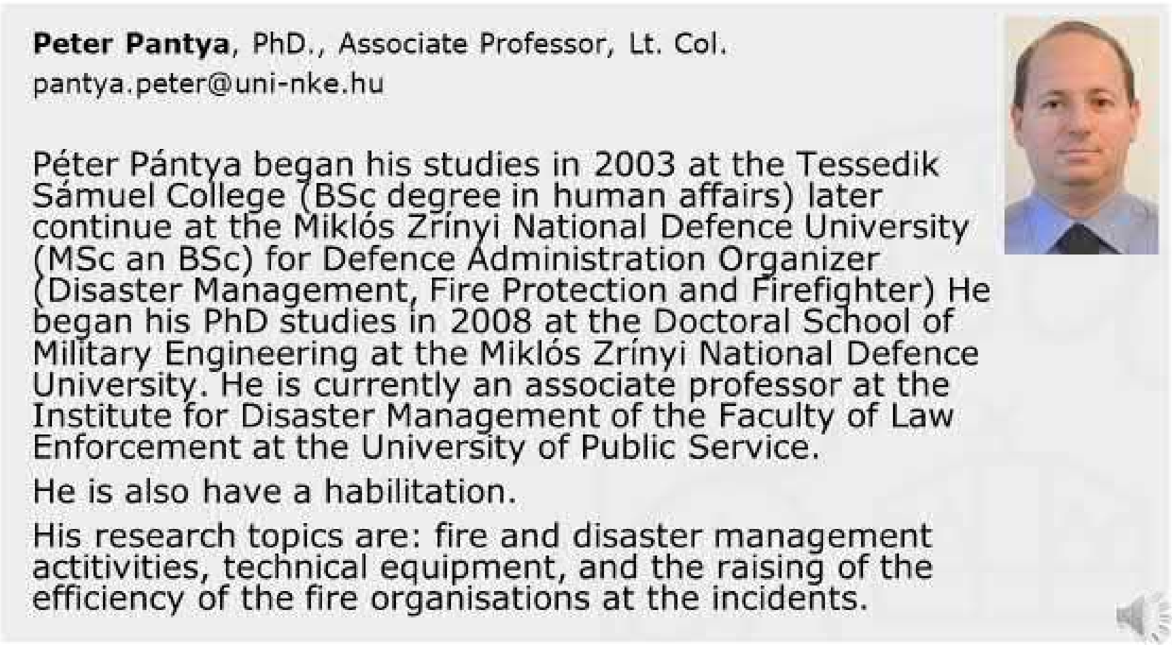
05 Conclusion

- Each fire experiment measures specific parameters.
- Every fire experiment has a limitation.
- For an accurate and reliable flammability assessment, results from more than one experiment is required.

12

Péter Pántya: *Issues of energy sources in the field of Fire Protection*





Structure of the presentation

1. Abstract of the presentation
2. Methods of the investigation
3. Demonstration of the results, the basic frames and solutions what found
4. Conclusions and Discussion about this issue for the fire protecion organisations
5. List of the references used for this presentation

Abstract

The built environment gives a frame to our life at home and during our working hours, travelling between them. In this circumstances multiple dangers are present to the people, some are by the built area and some by the standalone energy sources or the energy network.

The fire protection has two brotherly sides. One is the prevention line, for example by the authority work (licensing, control) and the other line is the intervention, for the firefighting and technical rescues.

In this presentation analysed some challenges and issues for the Fire Protection organisations in built environment and demonstrating some solutions to help the fire officers during the prevention and intervention duty close different energy sources.

Methods

The domestic and international literatures are analysed to find the best practises and solutions for the fire protection, disaster management organisations in issues with different energy sources e.g. solar panels and Li-ion batteries.

The possibilities for their adaptation to the Hungarian fire protection and disaster management system are examined.

Results

In the built environment (home or office buildings, industry, producing or storing buildings) there are always needs for some kind of energy source. [1]

They can be traditional (e.g. electrical network by power plants) or alternative (e.g. solar or wind energy) and local.

Using alternative energy sources gives new challanges for the fire protection bodies also in the preventive and also in the intervention side.

Fire and shock risk without working electrical network. [2]

These alternative energy sources can be standalone solutions and sometimes independent from the electrical network.

Some possibilities can produce electricity with fire and shock risk after shutdown. [3]

The **wind turbines** can give more simple task in this issue:

In a damage = can stop rotating = Does Not Producing Electricity = Lower fire or shock Danger

The task for the fire units in this case = Secure the safety in the close environment, mainly technical rescue, lifesaving (sometimes in high)

The fires of wind turbines in many places not results fire spreading due the distance from built environment. [4] [5]

Picture 1:
www.imperial.ac.uk/news/153886/fires-major-cause-wind-farm-failure/

Solar panels, Photovoltaics

The installations or plants can be close to the homes and the industry fields also.

This energy sources can ignite or cause a fire what can reach protection need building.

Nowadays there are a lot of installation on the roof tops of houses in the city centres. Fire dangers directly to the people, their values and goods.

Solar panels after shutdown

During the day, in sunlight or in cloudy weather the solar panels producing electricity in different extent.

After shutting down its system or cut from the electrical network (where the produced electricity transferred and the needed electricity come from during the night period) each elements of the solar power plants – such in roof size – Do Not Stops Producing Electricity! [6] [7]

Lithium-Ion Batteries and the Fire

- Some standalone energy source charge batteries, e.g. Li-Ion types.
- On this type, by a damage or other issue there can be an internal short circuit what cause, ignite a fire.
- The fires of lithium-ion batteries are very heavy to put out. It can takes hours and important to check the batteries after the fire extinguish to control the temperatures.
- If the temperature of the li-ion batteries start to raising again, can ignite a fire again, there is need for the fire units. [8]

Discussion, Conclusions

In the field of fire issues by alternative energy sources analysed some ways of producing.

The fire risk by the wind turbines are lower than by the solar panels.

In the cases of solar panels the Fire Protection bodies (prevention, intervention also, all over the world) must reach to stop producing electricity in danger of fires or at accidents what need technical rescues. [9]

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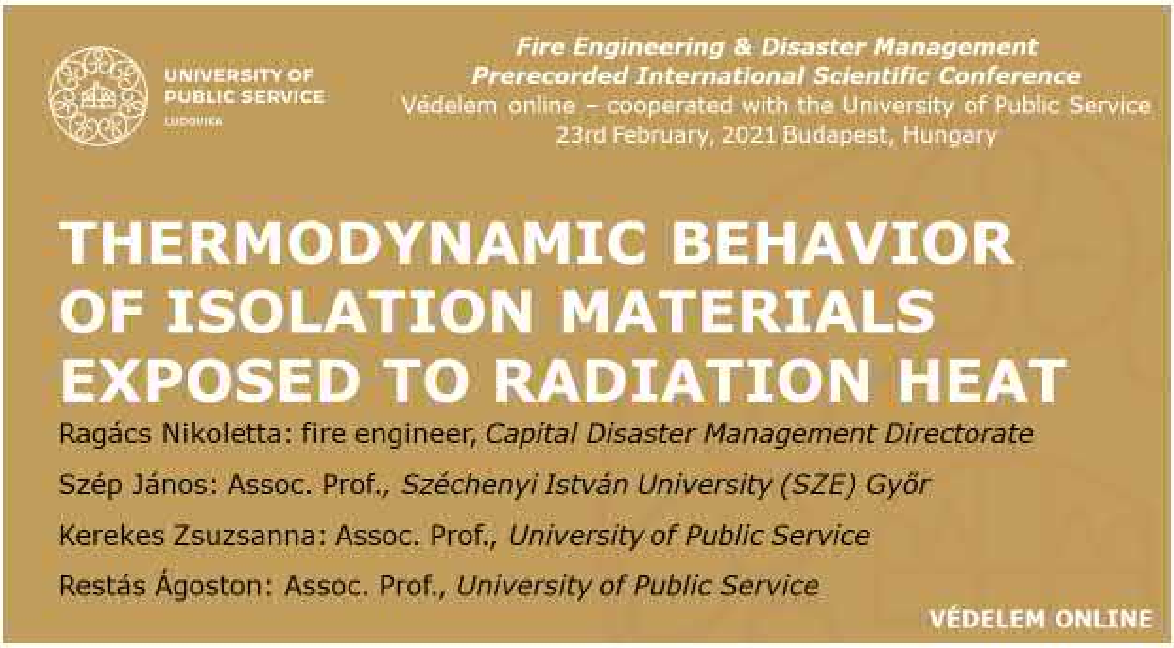
Nikoletta Ragács – Szép János - Zsuzsanna Kerekes – Ágoston Restás: *Thermodynamic behavior of isolation materials exposed to radiation heat*



Structure of the presentation

1. Abstract
2. Introduction of the presentation
3. Insulating test material samples
4. Test methods
5. Test results
6. Thermodynamic test
7. Discussion, Conclusion

References

1. Abstract

Due to the diversity of the materials sold, the differences due to the production technology, the different areas of application and the variety of coating systems, completely new features appear. That is, they will behave differently not only under direct flame but also under heat load [1].

When non-flammability, fire propagation limit, chemical composition, tensile strength, densities, thermal conductivity value are given in the rating, the features related to thermal radiation are not. However, the formation of a flame is always preceded by heat [2][3].

In our work, we examine whether it is sufficient to give a direct flame effect for the classification of insulation materials, or heat-insulating materials exposed to radiant heat show significant damage [4].

In our work, we investigated the thermodynamic nature of three insulating materials as a function of temperature and time. The aim of the test against radiant heat is to determine the change in a heat load in a selected material without a direct flame effect. According to EN 13 773, the standard heat source was chosen as the radiation source, which cannot be qualified as a text.

2. Introduction

The most important element of energy efficiency in buildings is thermal insulation. The use of insulating materials entails the adverse behavior of combustible plastics against fire. In the case of building fires, the leading deaths are not injury caused by burning, but suffocation due to toxic combustion gases generated during the combustion [5][6][7].

The incorporation of insulating materials is still one of the most combustible materials to date. The incorporation of highly flammable material products greatly increases the fire risk of our buildings. The aim of the tests is to show that the selection of thermal insulation plastics is not only important due to flammability requirements (e.g flame spread) but also their ability to generate heat [8] [9].
(smoke generation)

3. Insulating test material samples and and their fire protection characteristics

For the study, we selected three insulation material samples that would be the most widely used commercially available in the construction industry. Fire protection classes of the examined sample groups

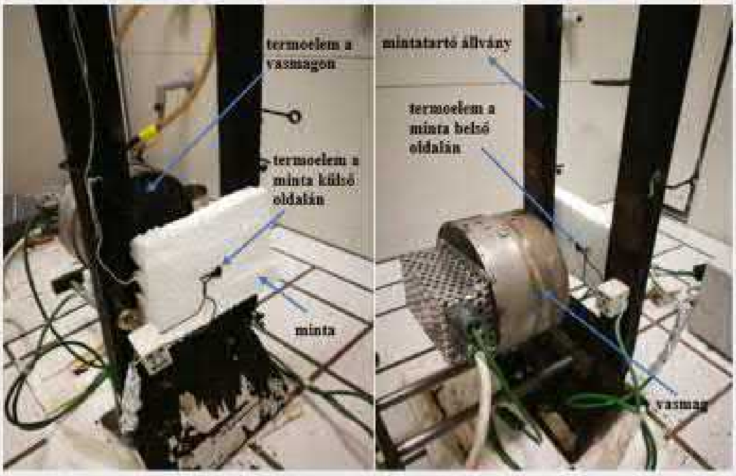
Expanded polystyrene and polyurethane foam are a substance of fire protection class "E" according to MSZ EN 13501-1, to which a flame retardant additive is added (flame retardant class "F" without the addition of flame retardant additives).

Fire protection classes	Test substance
„E" or „F"	**Expanded polystyrene**
„D" or „E"	**Polyurethane foam**
„A1"	**Rock wool**

4. Test methods: Heat load with radiation source

- Physical changes on the surface of the samples were observed by increasing the temperature of the heat source.
- The heat source was chosen the radiation source according to EN 13 773, which classifies the non-combustibility of textiles. The heat source used is an electrically heated iron core. Maximum heating temperature 750 °C.
- During the test temperature changes was measured by thermocouples located on both sides of the sample.
- Dimensions of test materials: 150 mm wide x 100 mm high; 30 mm thick.
- Location of measurements and equipment: Szent István University Ybl Miklós Faculty of Civil Engineering Institute of Civil Engineering fire protection laboratory

Equipment of heat load

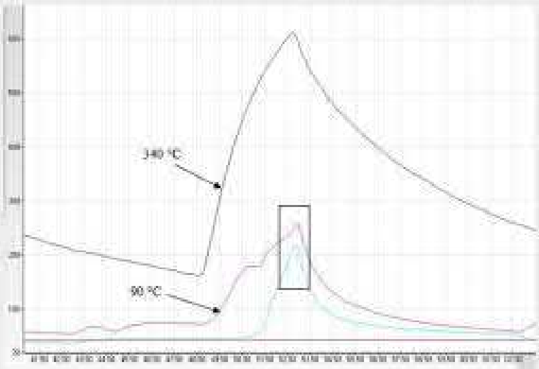


5. Test results

Temperature diagrams measured on surfaces: the temperatures shown by the thermocouples are marked in the form of a line diagram in three colors:

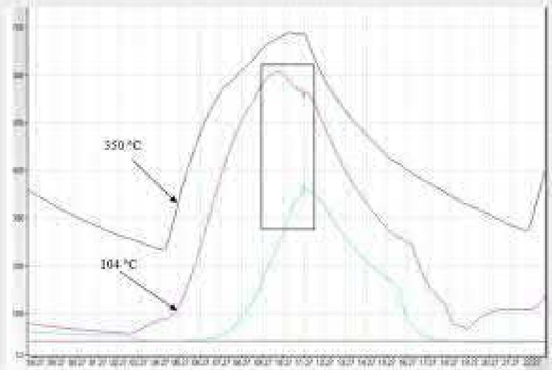
- the temperature change of the iron core is shown by the **dark blue curve (at the top)**;
- the temperature change of the thermocouple on the inside of the test sample is shown by the **purple curve (in the middle)**;
- the change in temperature on the outside of the test sample is shown by the **light blue curve (at the bottom)**.

5.1 Results of radiant heat testing of expanded polystyrene foam



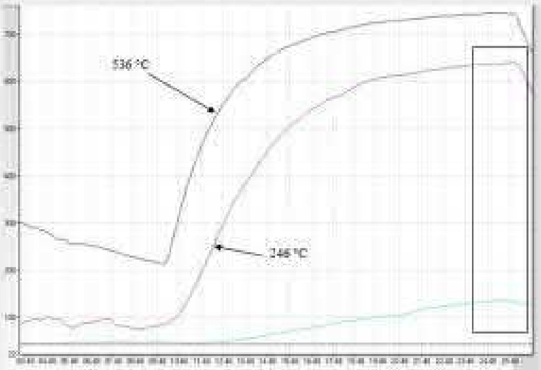
At 90 °C, the first physical lesion was seen, which is an endothermic peak, i.e., the onset of melting.

5.2 Results of radiant heat testing of expanded polyurethane foam



Change due to radiant heat in the case of polyurethane foam: fast development of surface temperatures and damage started at 104 °C.

5.3 Results of radiant heat testing rock wool



On the side exposed to the heat source, the browning of the material began at 246 °C. The temperature of this side increased in proportion to the temperature of the heat source, but the temperature on the other side of the rock wool remained permanently low, no change was observed. Reaching the maximum heating temperature of the radiating iron core, 744 °C, the temperature on the back rose just above 100 °C. Minimal smoke formation was observed. The equipment reached 744 °C in 17 minutes.

6. Discussion, Conclusion

Due to the diversity of the materials sold, the differences due to the production technology, the different areas of application and the variety of coating systems, completely new features appear. That is, they will behave differently not only under direct flame but also under heat load.

When non-flammability, fire propagation limit, chemical composition, tensile strength, densities, thermal conductivity values are given in the rating, the features related to thermal radiation are not. However, the formation of a flame is always preceded by heat.

In our work, we examine whether it is sufficient to give a direct flame effect for the classification of insulation materials, or heat-insulating materials exposed to radiant heat show also significant damage.

An important element of insulation performance is the measurement of surface temperature. The measurement results and the values obtained confirm the deviations and also provide information on what behavior is expected when heat (higher than 200 °C) is applied to the insulating materials.

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Mónika Nováky: *Analysis both of the Official Fire Protection and Special Fire Protection Authorities in the System of Integrated Disaster Management*

Abstract

The system of tasks of the professional disaster management body comprises a very wide range of activities. The tasks based on industrial security, fire protection and civil protection include authority prevention of disasters, organization and management of protection, implementation of rescue in emerged civil emergencies, as well as liquidation of the harmful consequences and realization of restoration-reconstruction. In addition the industrial security, the professional field of water affairs and water protection have been performing more widely authority and professional authority activities in the past periods. Authority activity is the important part of disaster management, prevention, planning and organization activity. The fire protection authority takes licencing, prohibiting and limiting measures, conducts fire inspections, issues authority certificates and imposes fire protection fines during its activity.

Key words: disaster management, fire protection, authority and professional authority activity, prevention

Protection, security

- the fundamental element of the national security
- protection of the individuals and groups

Unified defense management

Formed the professional disaster protection organization of Hungary

- It was established on January 1, 2000 the National Disaster Management Main Directorate of the Home Ministry
- for the purpose of uniform protection against disasters

on January 1, 2012 the institutional and organizational framework for disaster management has been renewed

Prevention and risk reduction tasks

- tasks to protect
- the safety of life and property of the Hungarian population
- the national economy
- the safe operation of critical infrastructure elements
- it support investments with priority from the point of new of the national economy

Disaster management task system

- industrial safety
- civil protection
- fire protection

Defence administration

- includes performance of the administration tasks related to the tasks of national protection
- mainly covers the tasks of national defence administration,
- law enforcement and defence economic planning
- Its aim is to achieve the security of the country, an important cornerstone of which is the effective responses of the defence administration system to the global, European and national challenges affecting the security of our country

Disaster protection

includes

- the tasks of industrial security
- civil defence
- fire protection tasks of the professional disaster protection organization

Authority activity

- performed in the integrated disaster protection system
- with harmonized central coordination

purpose of the complex system is :

- protection of human life and material assets
- prevention of disasters
- quick and professional management of them
- proper and earliest starting of the restoration

Authority activity

fire-fighting and technical rescue the special field of

- fire protection it licences
- introduces restrictions
- performs inspections
- issues official certificates
- imposes a fine against those who violate the fire protection obligations in the framework of official and professional authority procedures

Authority activity

performed by a fire protection specialty

- comprises fire prevention
- fire-fighting
- fire inspection

Authority activity

the authority procedure is a controlled activity

- compliance with act 150 of 2016 about the general public administrative order
- detailed rules are regulated by the decrees of the government and of the minister

Authority activity

- the system of protection against fire and the fire protection tasks, rights and obligations are governed by act 31 of 1996
- about protection against fire, technical rescue and fire brigades: Governmental decree 259/2011 (7th Dec)
- on the organization of fire protection authorities, fire protection fines and compulsory life and accident insurance for those dealing with fire protection
- Governmental decree 489/2017 (29th Dec) governs the general and special rules of fire protection authority procedures

The fire protection department conducts official proceedings

- market surveillance official procedure
- granting a derogation from the fire safety regulations for buildings and structures and the requirements for the intervention of fire brigades

Competent authority

- building authority procedures
- procedures of granting operating permit site licensing procedure
- licensing procedure of musical and dance events
- registration of social, child welfare and child protection service providers and institutions in the official register
- licencing procedure related to pyrotechnical activities

Summary

official activity of the professional fire protection organization in the field of fire protection is **very wide**

within the framework of the **official procedure**:

- it may adopt licensing
- restricting and prohibiting provisions
- carry out inspections, which serve the safety of life
- property

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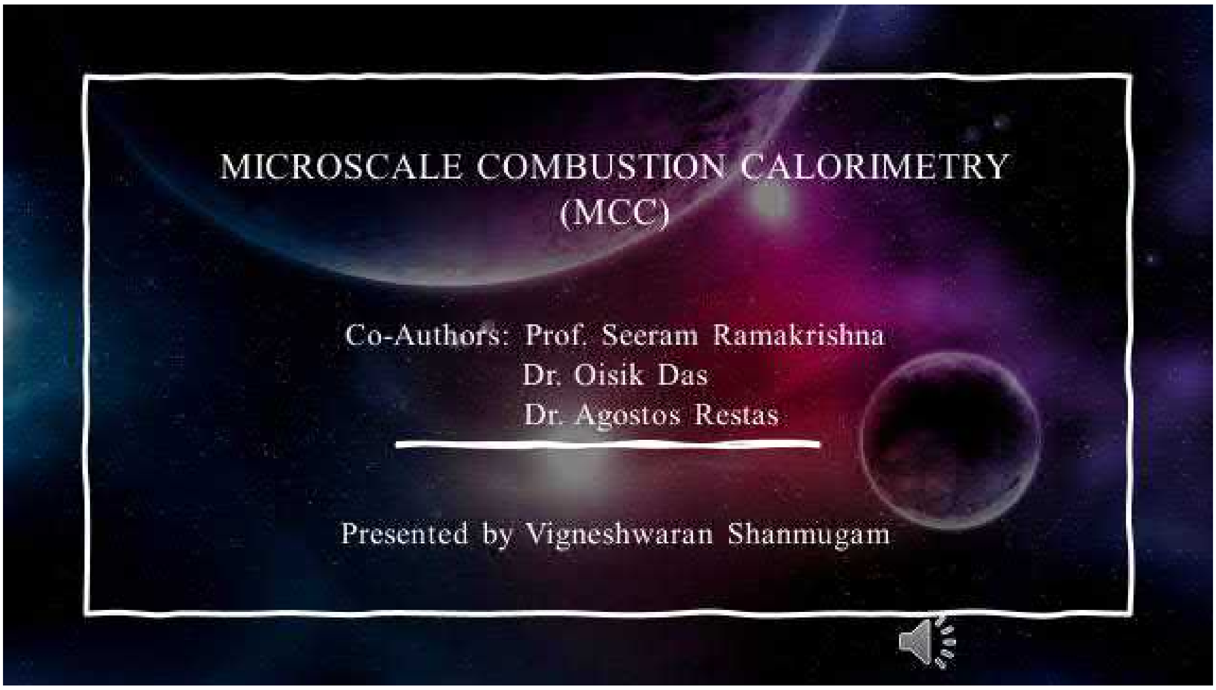
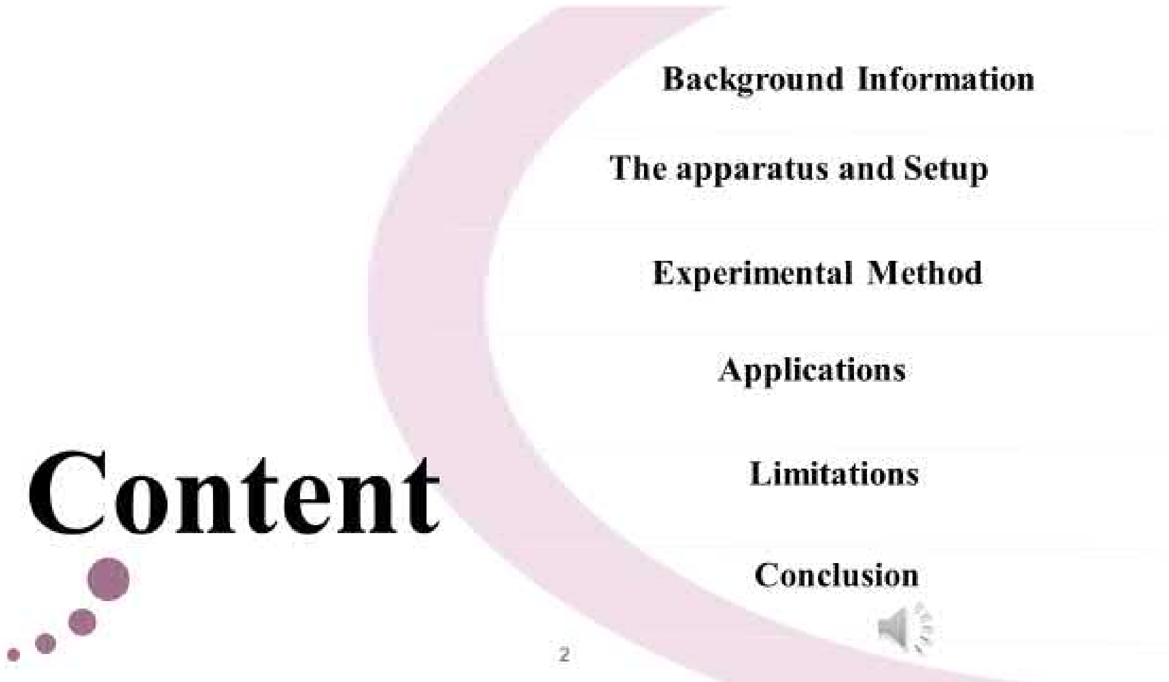

MICROSCALE COMBUSTION CALORIMETRY
(MCC)
Co-Authors: Prof. Seeram Ramakrishna
Dr. Oisik Das
Dr. Agostos Restas
Presented by Vigneshwaran Shanmugam


Content
Background Information
The apparatus and Setup
Experimental Method
Applications
Limitations
Conclusion
2

Background Information

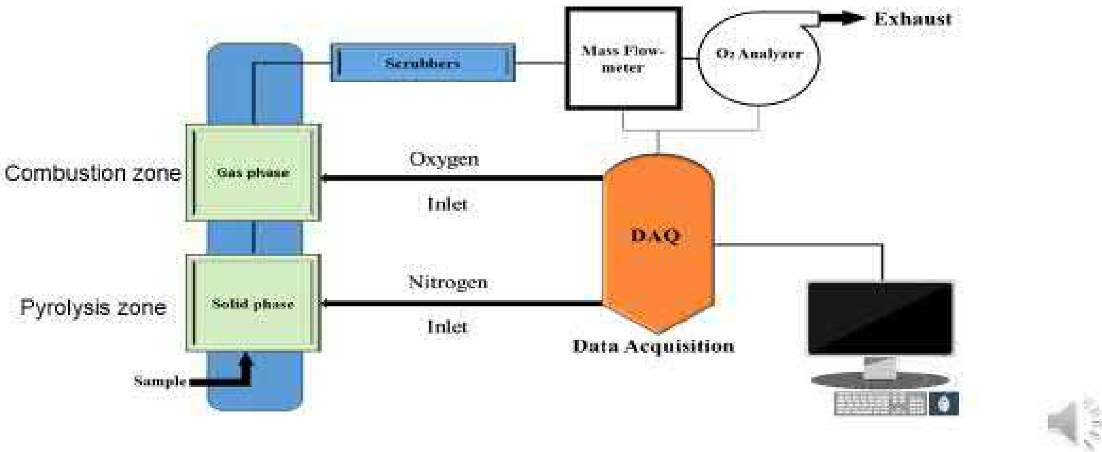
- It was developed by Richard E. Lyon and Richard Walters from the Federal Aviation Administration.
- MCC is a small-scale fire experiment.
- Milligram sized samples within a mass range of 0.5 – 50 mg are required.

Background Information

- Heat release measurement is based on the oxygen depletion theory.
- ASTM D7309 is designated for MCC experiments.
- Unlike the cone test and TGA, it is a non-flaming test.
- The MCC experimental method leads to a forced complete combustion.
- Stipulated range of heating rate for MCC experiments is 0.1 to 5 $K\,s^{-1}$

The Apparatus

The Setup



The Experimental Method

- Has a separate pyrolysis and combustion stages.
- The MCC apparatus has two pyrolysis modes: Method A and Method B
- For Method A procedure, samples are heated in inert atmosphere, usually nitrogen, in the pyrolysis stage. The volatile gases are purged from the pyrolysis zone and mixed with excess oxygen for complete oxidation in the combustor.
- The procedure in Method B follows a sample pyrolysis in a mixture of nitrogen and oxygen gases prior to complete oxidation of effluent in the combustion chamber.

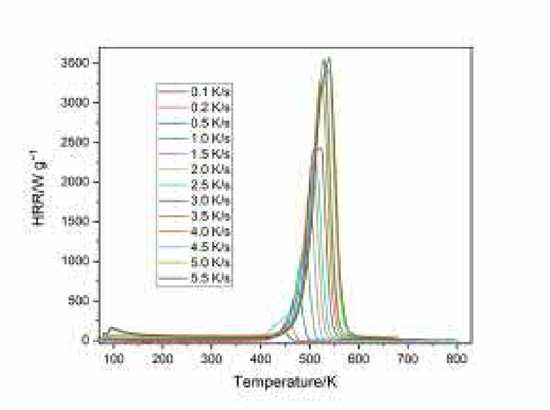
MCC MEASUREMENTS

❑The measurements from the MCC experiment are;

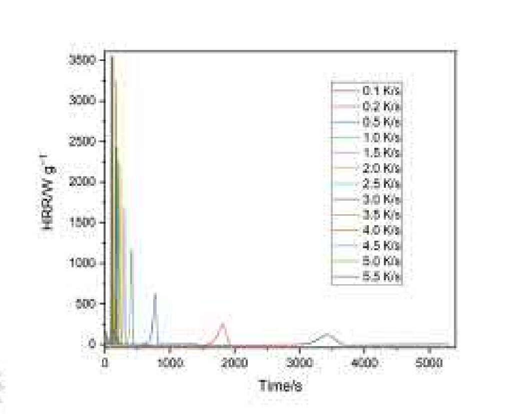
- peak heat release rate (pHRR)
- Time to pHRR (pTime)
- Temperature at pHRR (pTemp)
- Total heat release (THR)
- Heat release capacity (HRC)
- Residual mass.

Typical MCC Curves

Plot of heat release rate against temperature



Plot of heat release rate against time



Applications and Limitations

Applications

- Obtaining flammability properties of materials.
- Screening flame retardants

Limitations

- MCC is not a standalone experiment.
- It does not measure physical phenomena such as melt, drip, smoke release.
- Mostly used for research purposes.
- Sample mass affects the results.

QUESTIONS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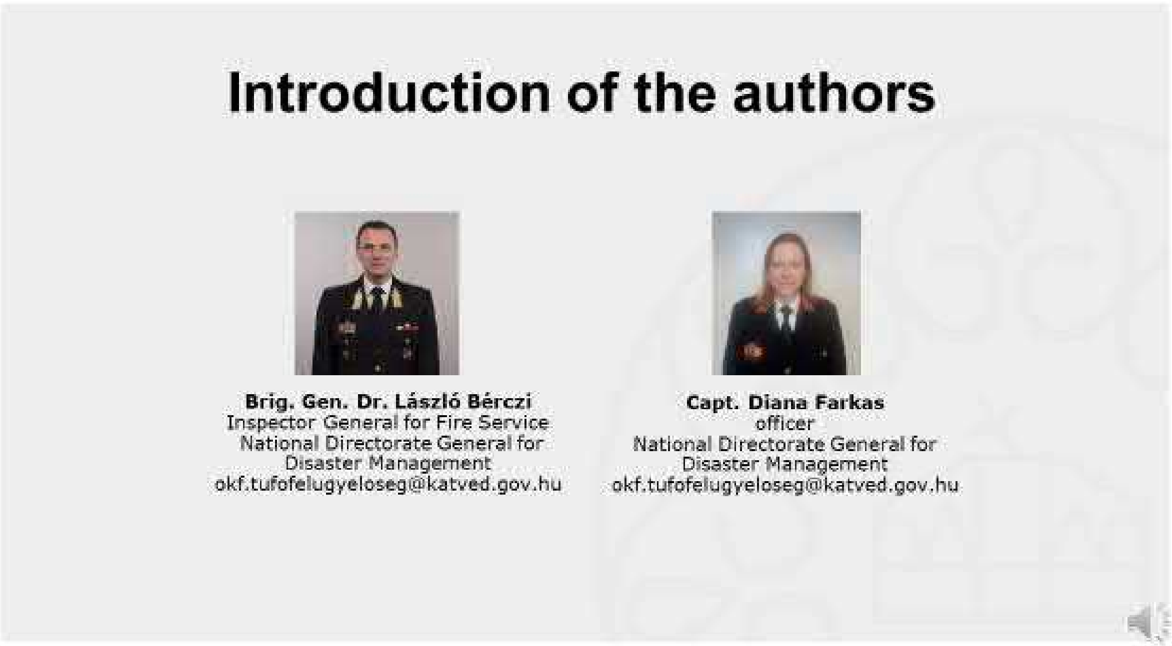
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Research on the development of the fire investigation procedures
Brig. Gen. Dr. László Bérczi
Capt. Diana Farkas
VÉDELEM ONLINE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okf.tufofelugyeloseg@katved.gov.hu
Capt. Diana Farkas
officer
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Development possibilities

- Personal conditions
- Material conditions
- International results
- Professional competitions
- Achievements

Personal conditions

Defining training levels:

After obtaining the basic qualification of firefighter (6 months)

- *Module I:* Fire Investigation basic training (two weeks)
- *Module II:* Fire scene training (two weeks)
- *Module III:* Forensic Science Topic (one week)
- *Module IV:* Other special courses:
  - Fire investigation course
  - Post Blast investigation course
  - Crime scene investigation course
  - Criminal inspection team leader course

Personal conditions

Additional fire investigator trainings:

- Training for chief fire inspectors (2/year)
- National fire investigation group (1/year)
- Training for fire investigation experts (2/year)
- Forensic fire investigation experts
- County / regional trainings with the police

Personal conditions

- In Hungary the fire investigations are conducted at the county level. The exception is Budapest, where a separate fire investigation service was organized for this task.
- ***525*** *professional firefighters currently have fire investigation qualifications of whom* ***150*** *people conduct fire investigations. The staff number has been reduced in order to raise the practical time of fire investigators.*
- *The average practical time of fire investigators is currently 5.73 years. Nearly 50% of firefighters obtained their fire investigation qualifications in the training system in 2014 or later.*

Material conditions

- All fire investigation vehicles have been replaced in the last 4 years in order to unify the necessary technical capabilities.
- The vehicles have the same equipment, tools and devices.
- We also proposed to use a uniform equipment to the CTIF Fire Invesigation Working Group.

Material conditions

Application development:

Main content groups

- Basic informations
- Weather
- Circumstances of conducting the investigation
- Site description data sheets
- Personal data
- Locking

Fire investigation procedure

Three-level fire investigation:

Fires are investigated on the basis of one of the cases below!

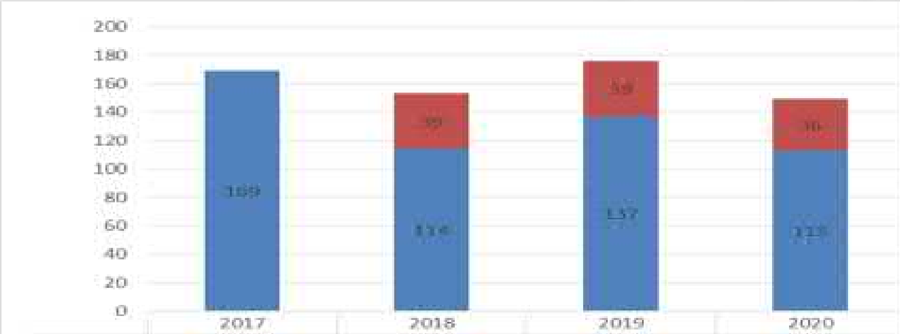
- **Fire/ Technical Rescue Form** is needed in all cases regulated.
- **Conducting a fire investigation procedure** – according to fire investigation rules.
- **Forming an inspection team** involving the police in complex cases.

Use of experts

- The opinion of a forensic expert outside the Disaster Management Research Institute may also be required (eg. forensic medical examiner)
- The institute was equipped with new, modern equipment, thus providing an expert background

Use of experts

➢Our decisions most often are based on the opinions of chemical experts conducted by the institute.



	2017	2018	2019	2020
Összesen	169	153	176	149
Külső		39	39	36
KKI	169	114	137	113

International results

International conference BUDAPEST

- Representatives from 11 European countries and from the United States of America also attended the International Fire Investigation Conference held on May 24-25, 2016 in Budapest.
- CTIF's delegates' meeting held in Helsinki on 8 September 2016 approved the establishment of an international fire investigation forum within the CTIF on Hungarian proposal.



International results

- ➢Forming the fire investigation working group within the CTIF.
- ➢The working group was formed between 31 May and 2 June 2017 at the Budapest Fire Investigation Conference.
- ➢The working group is chaired by Hungary and vice-chaired by the Czech Republic.

International relations

International results

Source: Hasičský záchranný sbor České republiky, Fire and Rescue Service of the Czech Republic

CTIF Fire Investigation Working Group held its second meeting in the Czech Republic from 5 to 7 June 2018

International results

Dutch, Danish, Belgian and Czech members of CTIF were present as observers. A Czech firefighter colleague also hold a presentation on car fires.

The head of the Vocational Training Department of the Police Education and Training Center spoke about the investigation of cases related to the crime.

International results

Conference

- Presentation of the Dutch fire investigation training
- Virtual reality in fire investigation training
- Propagation of combustion gases in combustible filled sandwich panel structures

(Folkert van der Ploeg's presentations)

Professional competitions

5th National Competition of Fire Investigators
Hajdúszoboszló, Hungary

Preparations

Site preparation, construction

Burning

Conducting the competition

Solving theoretical tasks

- Test sheet (individual task)
- Case study (team task)
- Creating a photo attachment from the pictures taken during the on-site inspection (team task)

The second day of the competition

Practical tasks

- Forensic photography task

The second day of the competition

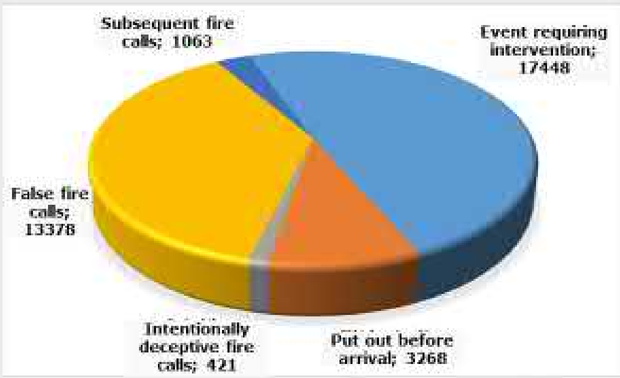
Practical tasks

- Object recognition

The practical task of the competition

- Conducting an on-site inspection

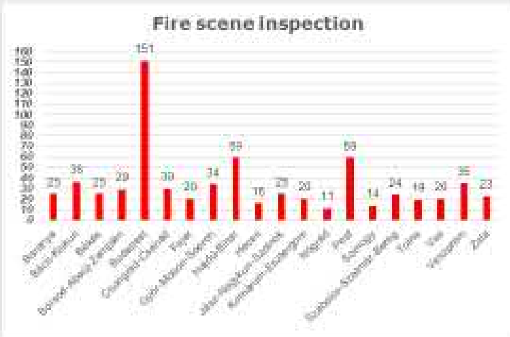
Distribution of fires



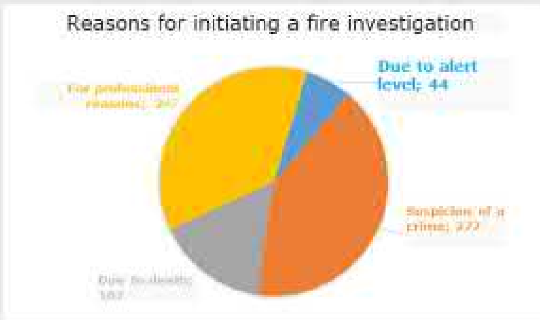
Fire case	2016	2017	2018	2019	2020
Event requiring intervention	13440	20820	15330	20913	17448
Put out before arrival	2799	3258	2934	3367	3268
Intentionally deceptive fire calls	378	472	403	440	421
False fire calls	15071	11169	12776	12939	13378
Subsequent fire calls	1293	1223	1091	1138	1063
Total	32981	36942	32534	38797	35578

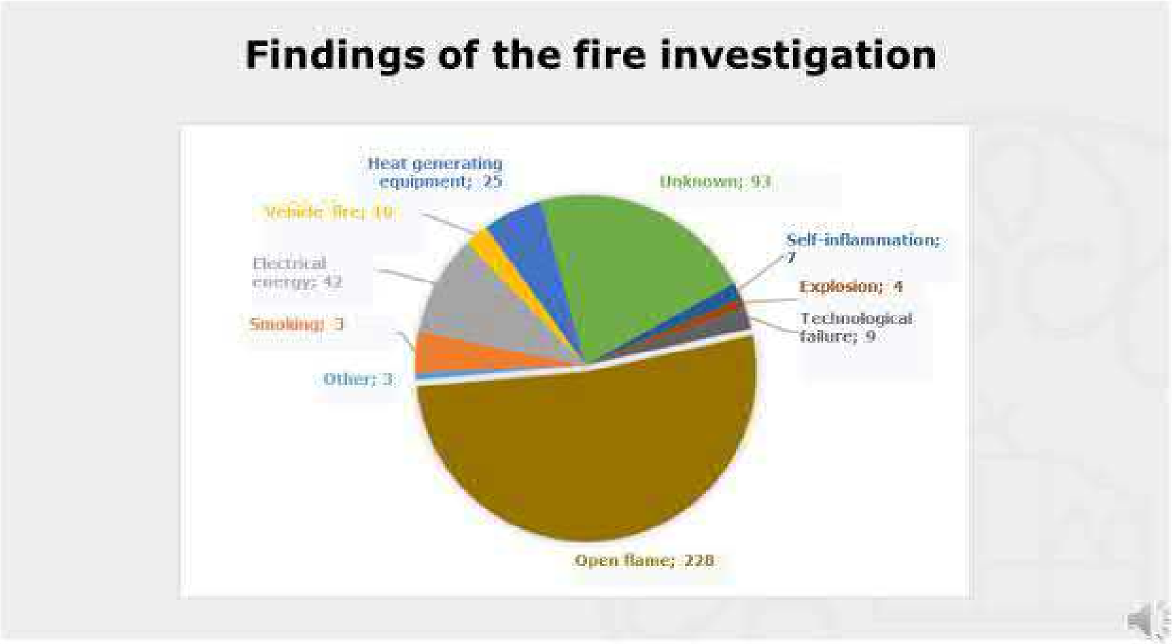
Distribution of fires

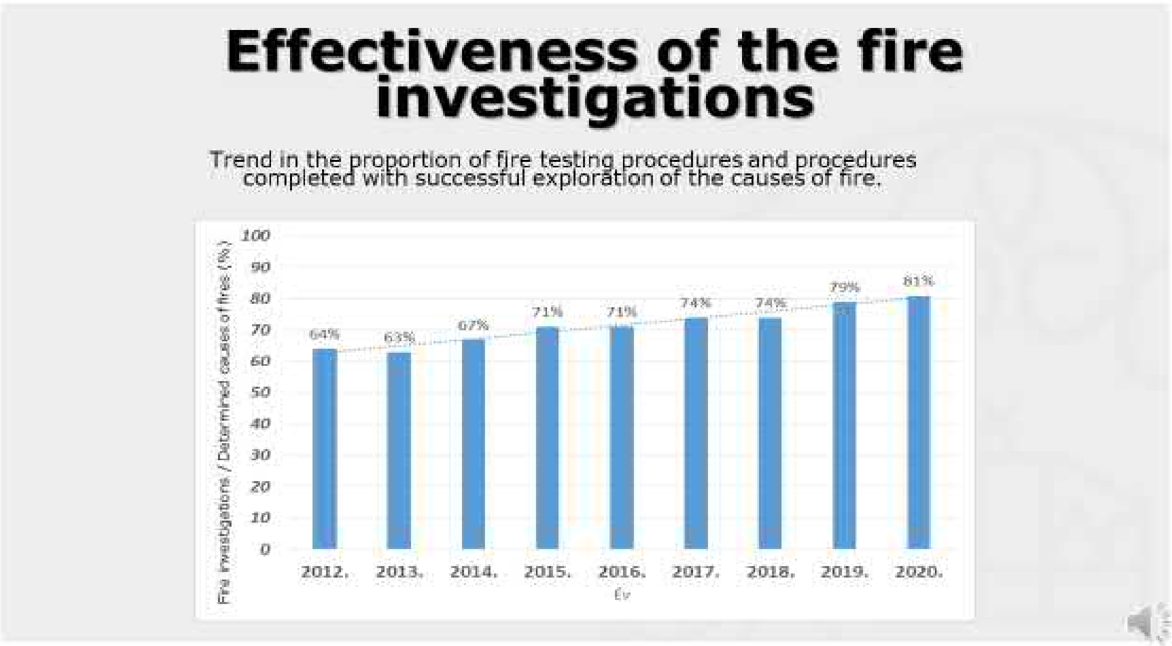
	2016	2017	2018	2019	2020
Open area	4592	10707	6497	12240	9121
Built environment	9773	11229	8896	8836	8715
Field of transport	857	875	1028	980	1014
Other	1017	1270	1843	2224	1866



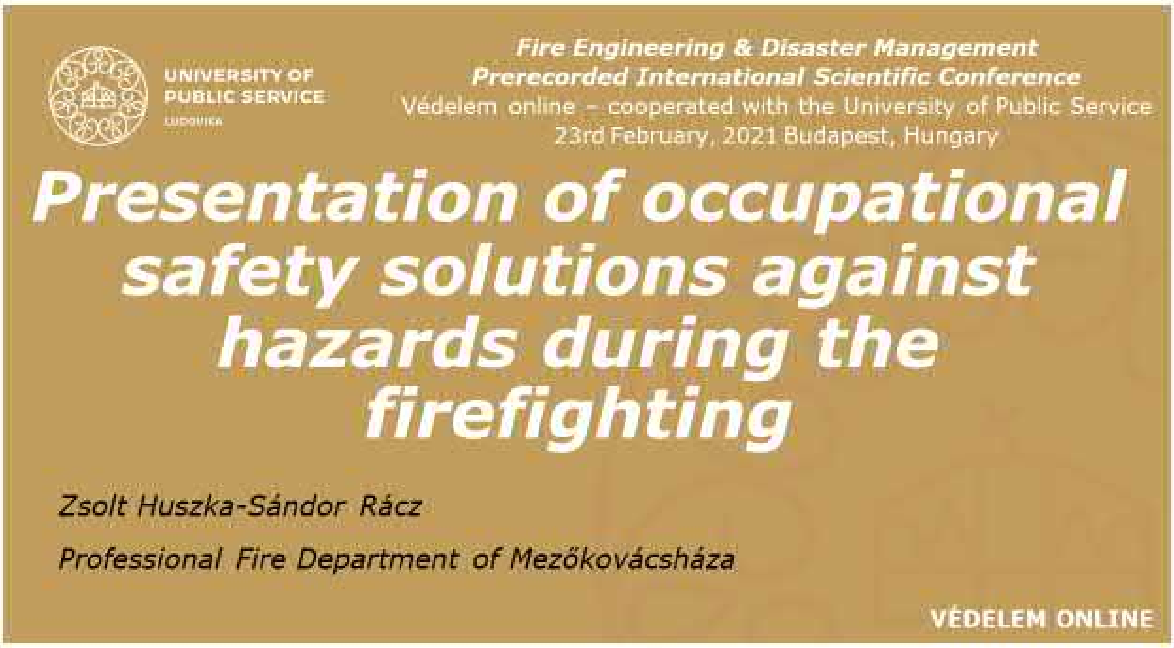
Fire investigation




Findings of the fire investigation
Heat generating equipment; 25
Unknown; 93
Vehicle fire; 10
Electrical energy; 42
Self-inflammation; 7
Explosion; 4
Smoking; 3
Technological failure; 9
Other; 3
Open flame; 228


Effectiveness of the fire investigations
Trend in the proportion of fire testing procedures and procedures completed with successful exploration of the causes of fire.
Fire investigations / Determined causes of fires (%)
100
90
80
70
60
50
40
30
20
10
0
64%
63%
67%
71%
71%
74%
74%
79%
81%
2012.
2013.
2014.
2015.
2016.
2017.
2018.
2019.
2020.
Év

Section C – Firefighting and rescue operation management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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Presentation of occupational safety solutions against hazards during the firefighting
Zsolt Huszka-Sándor Rácz
Professional Fire Department of Mezőkovácsháza
VÉDELEM ONLINE


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Contents of the presentation

Abstract

The number of work accidents shows a stable decrease compared to the number of employees. In contrast, accidents during the firefighting are fluctuating from year to year, they are difficult to predict, which is why their prevention is extremely important.

In this presentation, the areas of the increasing safety will be presented in case of firefighting. According to personal protective equipment, training and practice, psychological preparation, use of modern technologies and developments.

Predictability of work accidents

Figure 1 – The number of work accidents in Hungary.

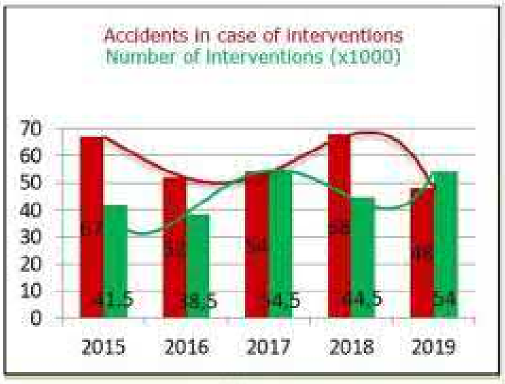

Figure 2 – The number of interventions and the number of accidents.

[1] [2] [3]

Personal protective equipment

Function of the personal protective equipment:
- protection from one or more hazards

Increase efficiency:
- suitable protective equipment
- professional use

the used personal protective equipment:
- gloves
- turnout gear
- fire mask
- helmet
- boots
- climbing belt
- respirator
- earmuffs

[4]

Training and practice

Firefighting is a practical profession. Accordingly, there is a significant emphasis on internships in undergraduate education, which covers more than 60% of lessons.

Firefighters undergo daily repetitive training and exercises in accordance with training plans to achieve an appropriate routine, in order to maintain and increase the level of knowledge acquired in school.

[5]

Psychological preparation

The most common sources of stress for firefighters are:

The consequences of undiagnosed and untreated stress have serious physiological effects on the life expectancy.

- traumatic experiences
- trials
- imperviousness
- internal conflict
- unpredictability
- risk of injury

[6] [7] [8]

Modern technologies

This includes any new solution that seeks to detect a hazard, reduce its harm, or eliminate it altogether.

These can be from the used materials for protective equipment to the accessories into the firefighting robots.

Picture 1-
C-Thru Smoke Diving Helmet

Picture 2-
3M SCOTT Sight mask

[9] [10] [11]

Procedures

Establishing rules for firefighting interventions based on procedures can be considered circumstantial, as all interventions are different.

However, rules can be developed to detect and rule out a significant proportion of the hazards.

The Hungarian regulatory system has established a mandatory system of rules in legislation, which aimed the increase of the safety.

Summary

In the previous slide I presented the methods for a safer intervention.

Each segment is equally important, their efficiency is negligible, they are effective only when they are used together in a system [12].

Negative experiences of past events are reflected in the security rules established in the procedures. In the present education and further training ensure the acquisition of appropriate knowledge, and the modern technologies allow the possibility of a safer intervention.

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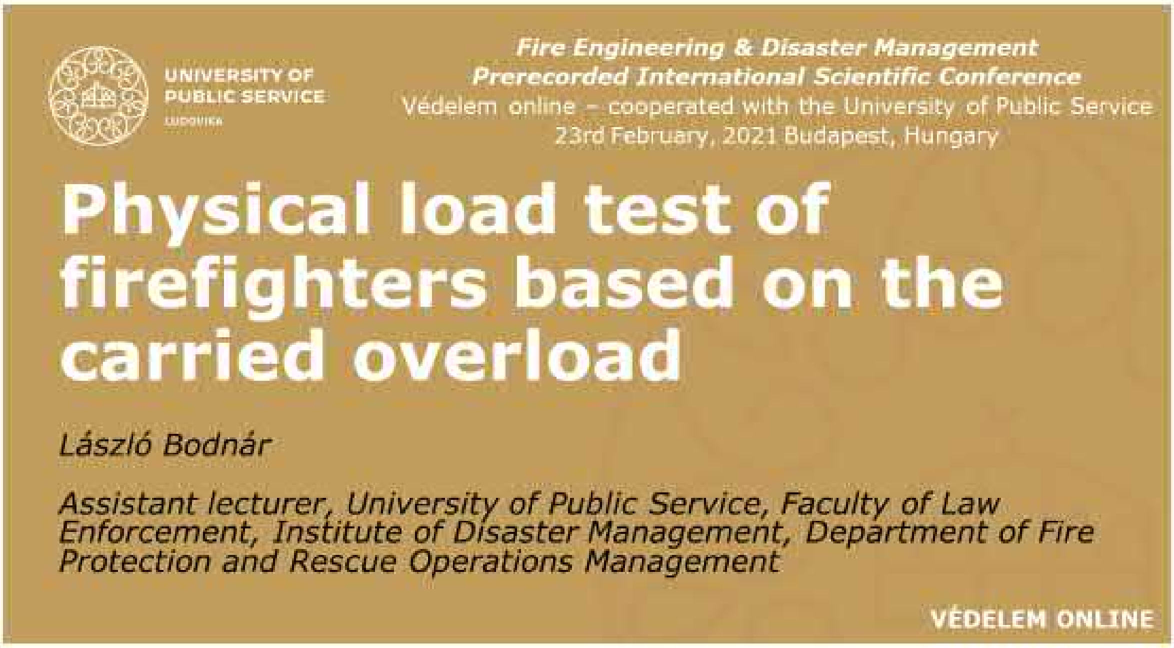
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23rd February, 2021 Budapest, Hungary
Physical load test of firefighters based on the carried overload
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VÉDELEM ONLINE


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Research topic
Research and development of methods to increase the effectiveness of firefighting in case of wildfires
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Contents of the presentation

- **Abstract** – scientific problem
- **Introduction** – present the physical performance
- **Methods** – own test
- **Data conditions of my test** – gender, age, BMI index
- **Results of my test**
  - time
  - burned energy
  - questionnaire
- **Conclusion** – need of a novel technical tool
- **References**

Abstract

- **The physical work of firefighters is tiring**
  - working with overload
  - influence on the health
- **Need for the effective firefighting**
  - to increase the physical performance of firefighters
  - reducing the physical load
  - to keep the free movement

At the same time

Helmet	1,72 kg
Protective hood	0,095 kg
Fire mask	1,23 kg
Radio	0,55 kg
Flashlight	0,36 kg
Turnout gear	2,38 kg
Respirator	11,88 kg
Nozzle	2,53 kg
Climbing belt	1,18 kg
Gloves	0,36 kg
Fire hose „C"	5,45 kg
Turnout gear	1,915 kg
Fire hose „B"	9,92 kg
Boots	2,76 kg
Total	**42,33 kg**

Introduction

- **Walking is the most basic type of movement.**
  - 1 step=75 cm
  - 5 km/h
  - Speed:<100 steps/min[1]

An average person
- 8 km/day
- 5 km/h
- with small load

A firefighter
- working with overload (protective equipment, tools)
- without longer rest [2]

A soldier
- 20 km/day
- 6.5 km/h
- with 30 kg overload[1]

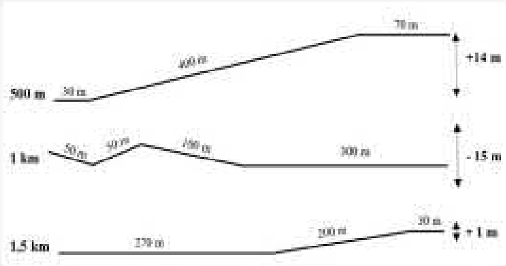
Objectives
- to point out the limitations of the load capacity of firefighters
- to extend the firefighting ability with free movement
- to propose the use of a novel, innovative technical tool

Methods

- **Making my own test with 5 volunteer firefighters**
- **Take a distance of 1.5 km two times**
  - 1st attempt: in the traditional way
  - 2nd attempt: with 25 kg overload
  - set up 3 checkpoints (after:500 m – 1 km - 1,5 km)
- **I measured**
  - time results with and without overload
  - burned energy with and without overload
- **Created a questionnaire**
  - assessment of further work

Data and conditions of the test

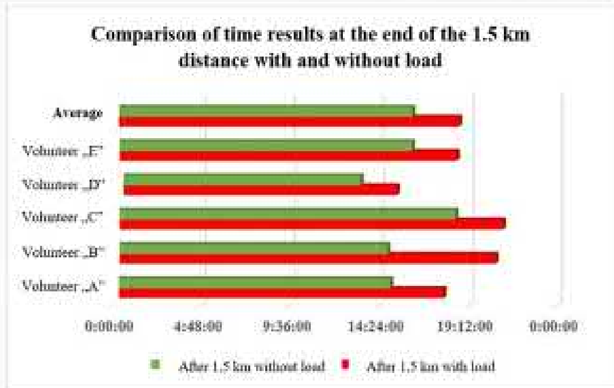
- **5 volunteer firefighters**
  - 4 men
  - 1 woman
- **Age group**
  - 20-29: 2 of them
  - 30-39: 2 of them
  - 40-49: 1 of them
- **Body mass index**
  - normal category: 2 of them
  - overweight category: 3 of them



Weather conditions during the test	
Temperature	26 °C
Air pressure	1 016 hPa
Humidity	31%
Wind speed, direction	2 km/h, NW
UV radiation	strong
GPS coordinates	47°36'50"N
	18°52'49"E
	altitude: 220 m

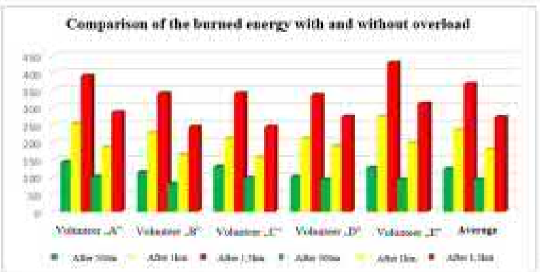
Results 1

- **Time results after 1.5 km without load**
  - Time average: 0:15:36
  - Speed average: 5.76 km/h
- **Time results after 1.5 km with overload**
  - Time average: 4.8 km/h
  - Speed average: 0:18:44
- The amount of time and the travelled distance increase proportionally [3][4].



Result 2

- **Burned energy without load**
  - Average: 271 kJ
  - 2-2.5 times more that the burned calories at rest
- **Burned energy with overload**
  - Average: 367,08 kJ
  - Difference: +95 kJ



Result 3

- **Questionnaire**
- **Completing the distance with overload**
  - difficult: 80%
  - very difficult: 20%
- **Additional overload above 25 kg**
  - average: +5 kg

Conclusions

- **Overload should be reduced** to increase efficiency of firefighting
- It is necessary to **increase** the **performance** of firefighters
- In general technical tools **cannot** simultaneously **maintain the free movement**
- The **tolerable load bearing capacity** of firefighters is **approx. 30 kg**
- **Working with a heavier load**
  - not more effective
  - harmful

Find a new technical tool for firefighters which
- increases the physical performance
- can reduce the physical load
- keeps the free movement

[5] [6] [7]

Exoskeleton

- **Special equipment**
  - used in military
  - used in health care

- wearable mobile machine
- allows the wearer to carry extra load
- minimal additional load on the body
- detects the wearer's movements and the overload
- can be mounted on the human body
- raises the overload instead of the wearer

- **increases the performance**
- **not harmful to health**
- **keeps the free movement**

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Presence of factors influencing a decision based on signals of the fire alarm system
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Service commander, Professional Fire Department of Kisvárda
Major Sándor Rácz
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Contents of the presentation

Abstract

In the field of fire prevention, the design, installation and reliability of fire alarm systems are **very important areas** [1]. In case of buildings with a fire alarm system, for example due to sensor contamination, negligent maintenance or environmental conditions, it is common **to receive several times a signal** at the same site. Experiences have shown that in case of a fire alarm transmitted by automatic device, due to the frequency of its occurrence, the firefighter considers the false fire alarm more likely than any other type of case. Interveners, due to the high incidence rate, **become somewhat resistant to this process**, they do not take into account the uniqueness of the case, and the presence of potential sources of danger. This miscalculation of probabilities **leads to** the development of **overconfidence**, which can put all participants in the intervention at risk and force them to improvise [2][3][4][5].

Continuous signals

- On the same day of the service / next days of service.
- To the same facility and location.
- Multiple signals→ in a short period of time.
- The contact person cannot cancel the alert .
- Firefighters will be alerted.

Figure 1 - Appearance of the alarm on the monitor (Created by the author).

[6] [7]

False probability estimation

- The alarm is linked by firefighters to previous experience. /**accessibility heuristics!**/
- Sentences like: „*There will be nothing now*!", or „*This will be a false alarm again*!"
- Pre-attached / probable information appears.
- Ignoring the uniqueness of the intervention. /**representativeness heuristics!**/
- Overconfidence, false sense of security. [8]


Figure 2 - The overconfidence (Source: http://vicceskep.blogger.hu)

Methods

- I analysed and interpreted studies, literatures, journals and papers dealing with classical heuristics.
- I had personal consultations with controllers and firefighters, I collected individual impulses from them.
- I present the positive and negative effects of heuristics through real, examples in connection with the signals of fire alarm systems.
- I categorized the relevant materials and established a cohesive relationship between them.

Results

- There is a difference between a public announcement and a signal of a fire alarm system. /subconsciously/
- Heuristics built into fire chief decision-making mechanisms serve as an effective shortcut.
- An appropriate level of professional, theoretical and practical knowledge reduces the distorting effects of heuristics.
- Knowing the factors influencing the decisions helps to rule out the negative effects of the heuristics.

Conclusions

- The presence and significance of heuristics is unquestionable.
- High occurrence rate → interveners become resistant
- An event is not related to the previous event.
- The signals of fire alarm systems should always be treated as a unique, equal source of danger in addition to signals via telephone or personally detected incidents.
- Ignoring potential hazards results in over calibrated confidence.

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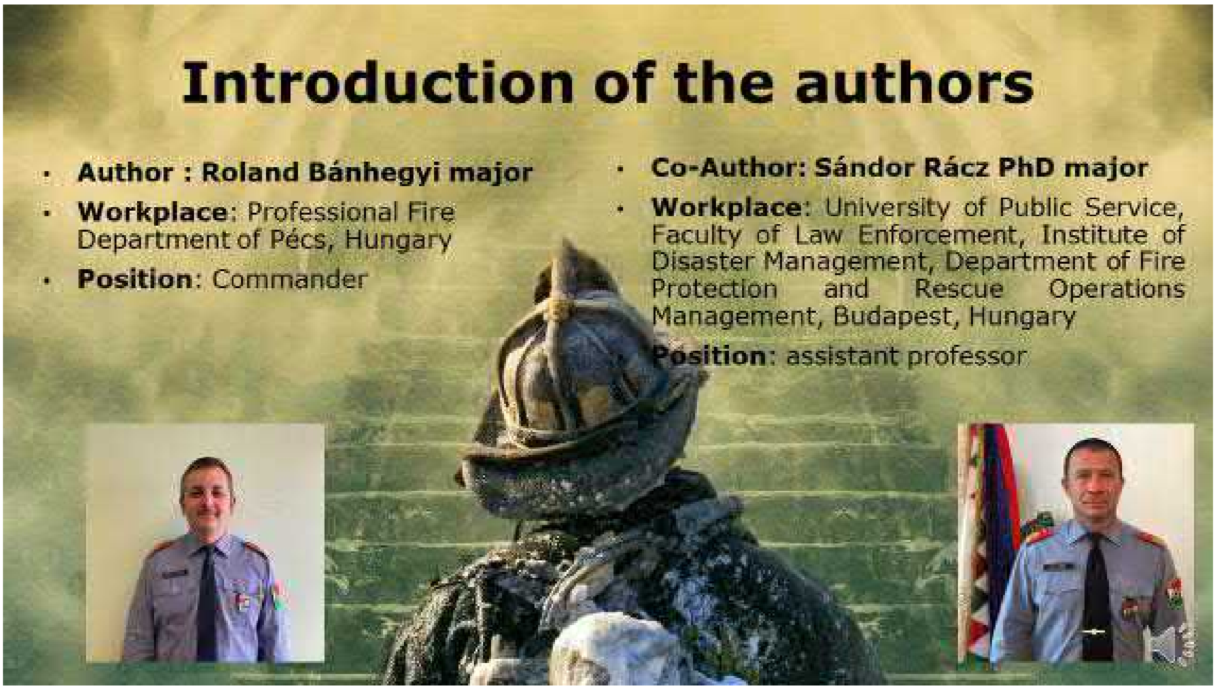
Roland Bánhegyi – Sándor Rácz: *Firefighting in case of solar panels*



Contents of the presentation

- Solar panel as a renewable energy source
- Firefighting in case of solar panels
- Theoretical firefighting solutions (painting, covering)
- Practical firefighting solutions (Extinguishing with dust and water, Pv stop)

Abstract

- This type of renewable energy is progressing quickly, so there is a need for this development to be followed by the disaster management [1]. This requires the acquisition and use of appropriate protective equipment and extinguishing material.
- Firefighting in case of solar panels can also be dangerous for firefighters, so it is important to be aware of the options that can be used to perform the effective and safe intervention [1].
- Firefighters should be preparing for fighting against installations under voltage if the solar panel or its immediate surrounding is burning. Firefighting can be performed successfully if we have the appropriate knowledge. At the international level, several experiments have been conducted for the effective tactics [2], some of them can be applied on the practical level [3].


Potential dangers
What is an opportunity for an average person it is a potential danger for the firefighters !
SOLAR PANELS &
POTENTIAL DANGERS
NFD
Two-way power supply
Whether 1500 V voltage
[4] [5] [6]


Covering
BLUE
Rather a theoretical solution
BLACK
Hard practicable in practice
RED
Can be used in areas not affected by fire


Painting
Equipment are not available
No practical experiences are known
Applied in theory


Extinguishing with dust
In case of small fires
From a distance of 1 metre up to 1000V
Providing the possibility of unplugging

PV STOP

Effective

Safe

Resistant

Easy to use

No secondary damage

PVSTOP


Summary
According to my research firefighters prefer the use water in case of firefighting primarily because of its accessibility.
If PV STOP becomes more popular, it could be increase the safe intervention, the effective firefighting and causes less pollution.
PVSTOP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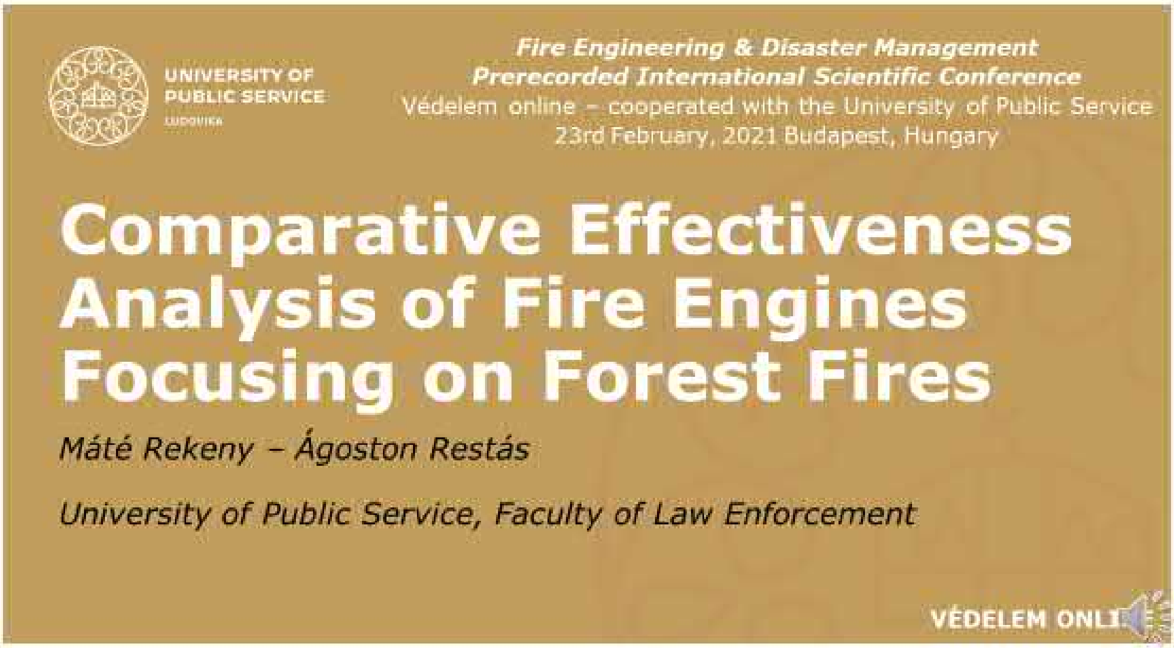
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Comparative Effectiveness Analysis of Fire Engines Focusing on Forest Fires
Máté Rekeny – Ágoston Restás
University of Public Service, Faculty of Law Enforcement
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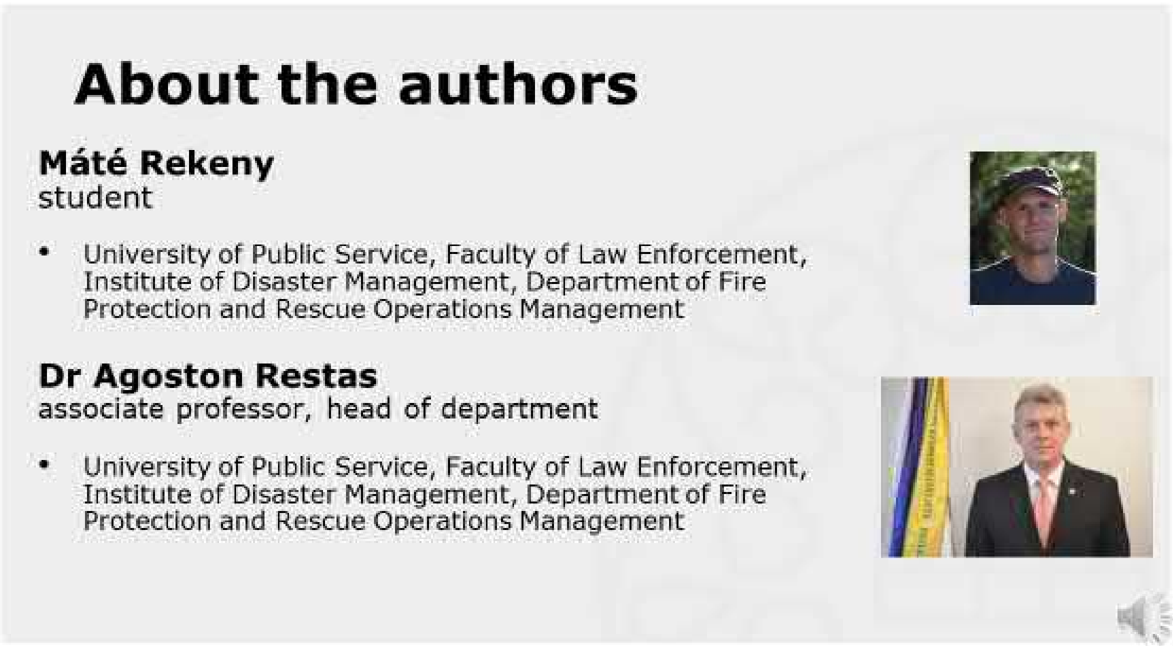
About the authors
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student
University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management
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associate professor, head of department
University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management

Contents of the presentation

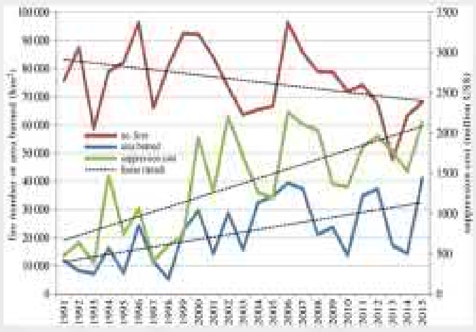
- Abstract
- Introduction
- Methods
- Data, and conditions
- Result 1
- Result 2
- Conclusion
- References

Abstract

The size of the burned areas during outdoor fires is higher year by year

At the same time, the value of the damage and the cost of the firefighting is increasing

One of the keys to reduce these is to start the intervention as soon as possible [1] [2]



By reducing the arrival time, the period of free spread of fire can be most effectively reduced

This requires small and simple fire trucks that can achieve high average speed of on dirt roads and in the field [3] [4].

Introduction

Fire departments usually arrive at the scene with moderately heavy fire trucks. The wildfires are often approached on dirt roads or on foot [3].

By using simple fire trucks, the average speed can be increased

type	Mid-mass truck	Simple truck
paved road	60	70
Dirt road	20	40
Rough terrian	N/A	10

Average speed (km/h)

Objective

- to determine whether the migration of a simple fire truck is effective
- illustrate the proportions of weight and size.

Of course, simple fire trucks are also smaller in size and weight, allowing you to drive on a road where the middle-sized trucks can stuck [5] [6].

In order to get information about the dimensions of the vehicles it is advisable to compare these values to each other [7].

Method

I calculated the arrival time on a specific road, with both weight classes:

- 10 km paved road
- 4 km dirt road
- 1 km rough terrian

I compared the dimensions and weights of the two mass classes graphically

Data and conditions

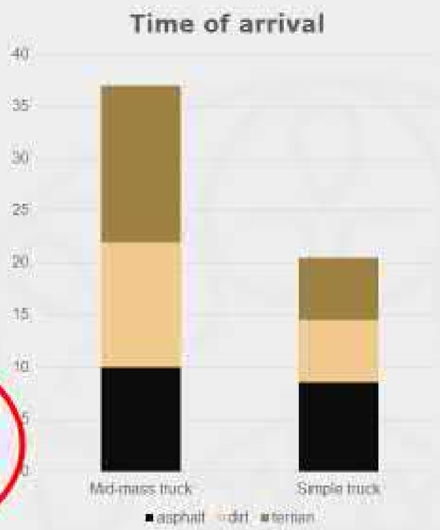
Type of road	Mid-mass truck	Simple truck
Paved road 10 km	10 min	8,5 min
Dirt road 4 km	12 min	6 min
Rough terrian 1 km	15 min (pedestrian approach)	6 min
Summary 15 km	37 min	20,5 min

Dimensions	Mid-mass truck	Simple truck
Front surface	7,4 m2	3,8 m2
Weight	16 t	3,5 t
Ground pressure	4,1 kg/cm2	1,7 kg/cm2

Result 1

- The simple fire truck covered the prescribed distance half the time
- As the distance increases, this value also increases proportionally
- Along with the time of arrival, the size of the area affected by the fire also increases proportionally.

By using simple fire trucks, the period of the free spread of fire can be significantly reduced. This reduces the time and cost of firefighting and the value of the caused damage



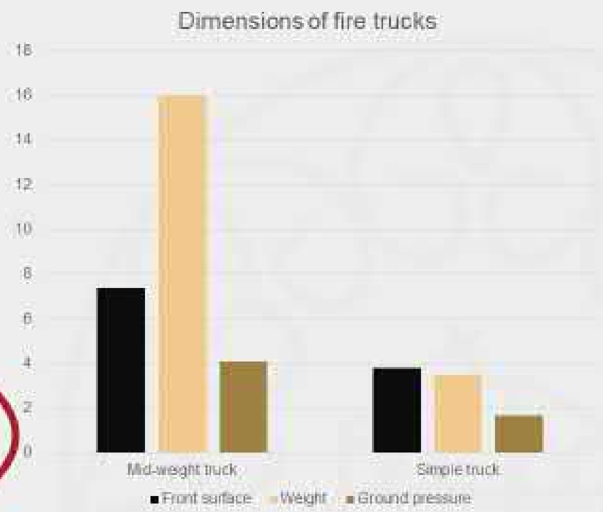
Result 2

Simple fire trucks are significantly smaller in size, and weight

- allowing them to travel on narrow roads
- low ground pressure allows you to drive on loose ground

There is no need for a walking approach

We save time



Conclusions

- One of the biggest problems with a wildfire is the approach of it
- The key to effective work is to start the intervention as soon as possible and to move flexibly in the field
- By using the appropiate vehicles, the time of arrival can be significantly reduced
- The small size of the vehicle allows to travel on narrow roads

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Rapid Fire Progress (RFP)
György Kós
Fire Safety Engineer
Delta-Fire Bt.


Introduction
• 40 hours basic fire fighter course (2010.)
• Fire fighter/Fire Safety Bsc (2012.)
• Disaster management MSc (2014.)
• SAR Tech. II. NSARA, Flagstaff AZ, USA (2014.)
• Fire Safety Engineer (2014.)
• Combat Medic/Tactical Trauma Life Support (2014.)
• Fire fighter Advanced Survival Techniques (2015.)
• Instructor Academico, La Vega Bomberos, DR (2019.)
• Fire/Rescue Instructor, PPA Medical (2019-2020.)
• Fire Instructor, On Angels Wings, NC, USA (2020-)
• Fire Chief, Vol. Fire-Rescue Fábiánsebestyén (2014-)

Abstract

Between 2003 and 2012, 63 firefighters died in a flashover-related incident in the US. Fire regulations are significantly tightened,but in modern construction the plastic-based and chemically treated wooden furniture favor extreme fire spreads. In fact, in today's buildings, flashover is spreading eight times faster than 50 years ago.

Flashover

National Fire Protection Association

As the fire continues to grow, the ceiling layer gas temperatures approach 900°F, increasing the intensity of the radiation on the exposed combustible contents in the room. The surface temperature of these combustible contents rises, and pyrolysis gases are produced and become heated to their ignition temperature. When the upper layer temperature reaches approximately 1,100°F, pyrolysis gases from the combustible contents ignite along with the bottom of the ceiling layer. This is the phenomenon known as flashover. (NFPA 921) [1] [2] [3]

Types of Flashover

- Hot Rich Flashover
- Hot Flashover
- Lean Flashover
- Delayed Flashover

Rapid Fire Progress (RFP)

Surviving the Flashover?

- Early recognition (high temperature, rollover etc.)
- Prevention (ventilating, gas cooling)
- Increase your chances of survival (point of no return)

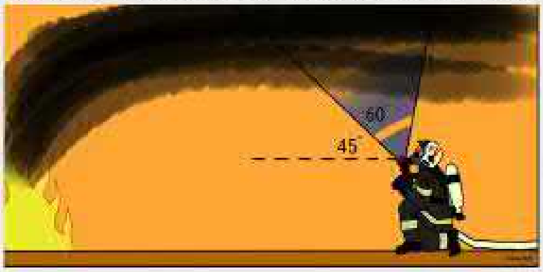
[4][5][6]

Gas Cooling Techniques

- Agressive Gas Cooling (European technique)
- „Penciling” (US technique)

Agressive Gas Cooling

- Set the nozzle on 60° fog pattern
- Give several short intermittent bursts of water into the upper atmosphere
- Do not use so much water that the thermal balance becomes upset



Penciling

- Set the nozzle to straight stream
- Use several, short intermittent bursts of water to cool
- Move the nozzle to cool different areas of the room

[7] [8]

Fully developed Flashover

Rollover

Penciling combined with Vent

Conclusion

- Early recognition (high temperature, rollover etc.)
- Prevetion (gas cooling, ventilation) [9]

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Full experiment here:Facebook: Rozsdás Kapacs Újratöltve
https://www.facebook.com/102023211933755/videos/718184869067598

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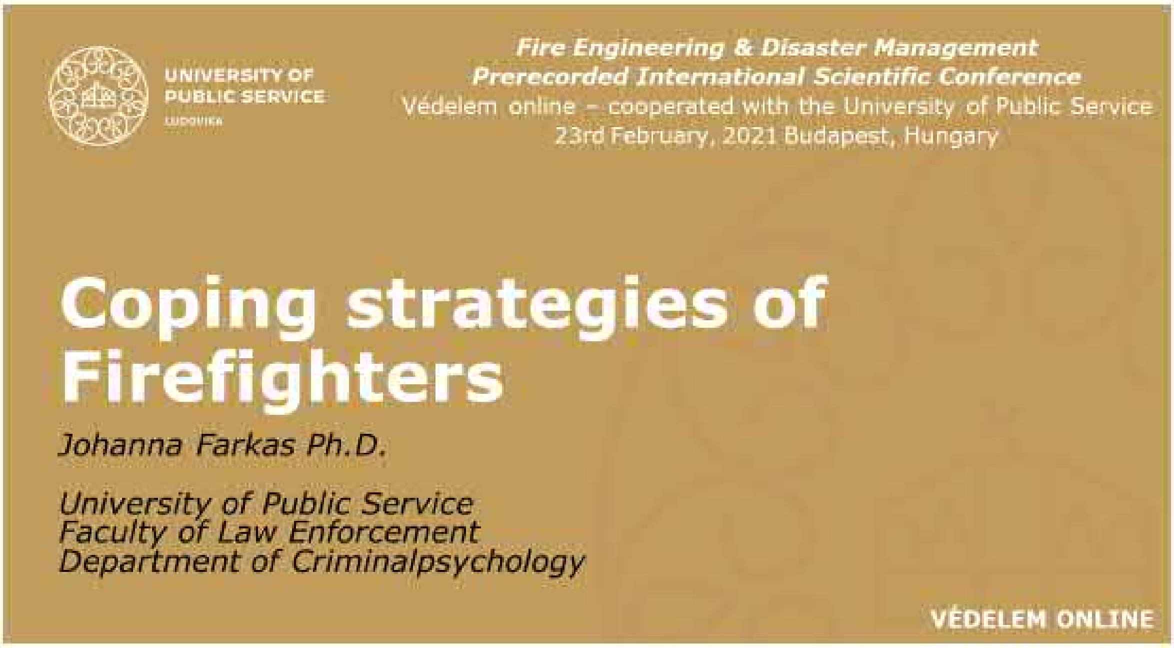
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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
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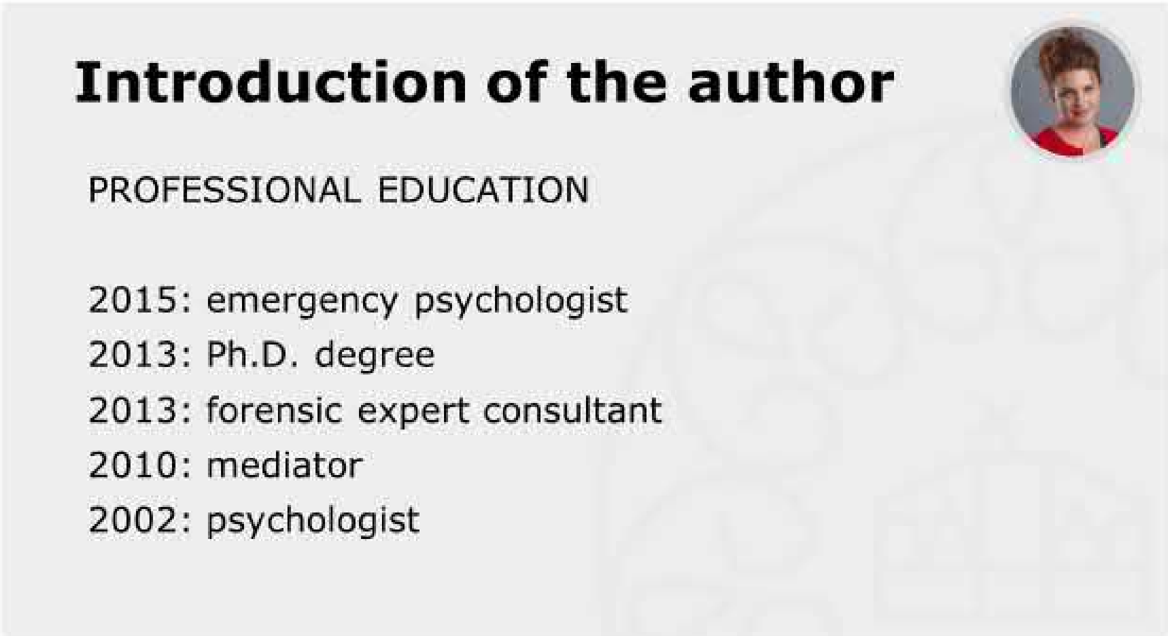
23rd February, 2021 Budapest, Hungary
Coping strategies of Firefighters
Johanna Farkas Ph.D.
University of Public Service
Faculty of Law Enforcement
Department of Criminalpsychology
VÉDELEM ONLINE


Introduction of the author
PROFESSIONAL EDUCATION
2015: emergency psychologist
2013: Ph.D. degree
2013: forensic expert consultant
2010: mediator
2002: psychologist

Abstract

- Risk of burnout, depression, and other mental disorders
- Aims to determine the effects of stress in professional firefighters
- 82 professional firefighters; 5 urban fire departments
- Coping Inventory for Stressful Situations and Coping and Stress Profile
- Results are not considered scientifically relevant.

Introduction of the Presentation

- Constant and intense stress in specific tasks
- High-risk factor to burnout and other mental disorders (Theleritis, 2020; Nydegger, et al., 2011)
- Cardiovascular disease is the leading cause of on-duty death (45%)
- Major cause of morbidity (Soteriades, 2011)
- Constantly living in stressful situations results in this population not only physical but also mental illness

Wildfires in Greece (2007)

Methods:

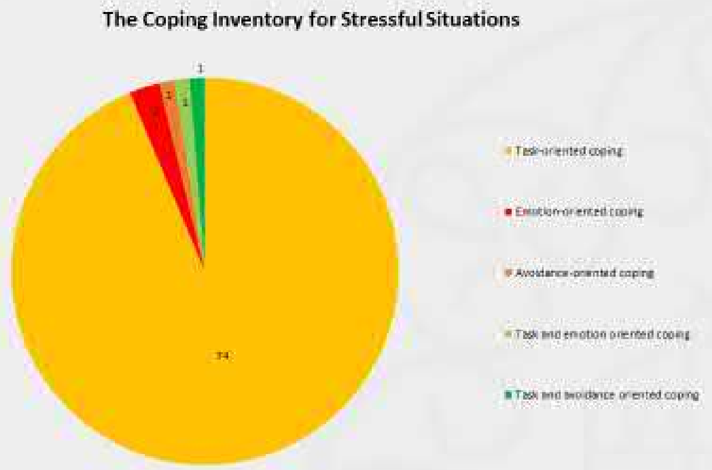
Participants

- 82 male firefighters (20-47 years) in 5 urban fire departments

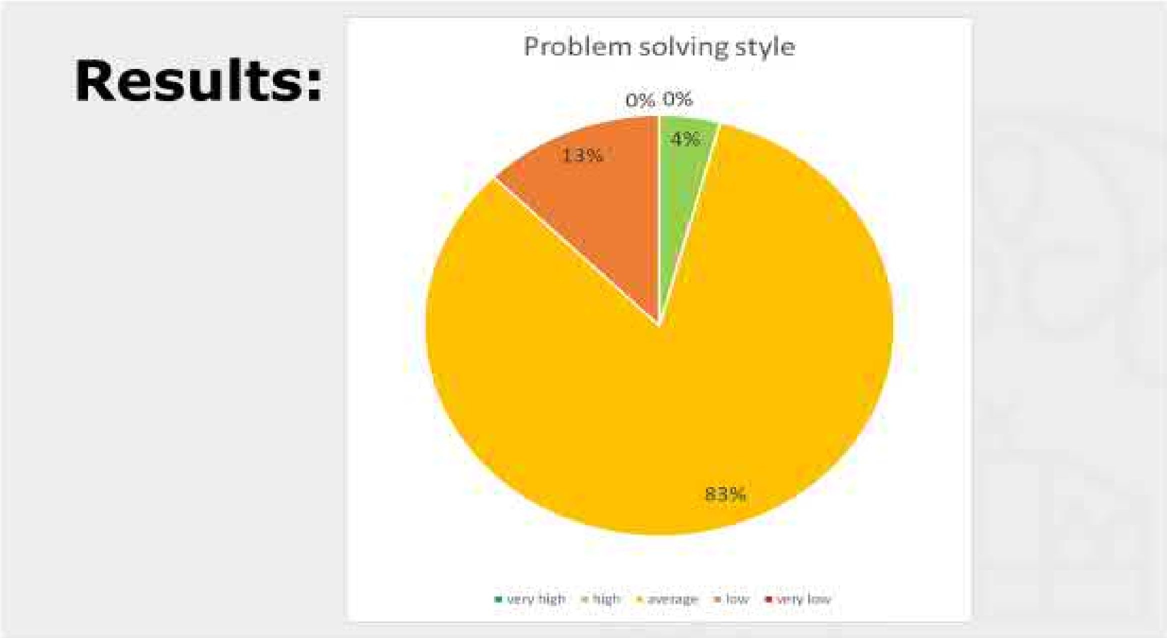
Procedure

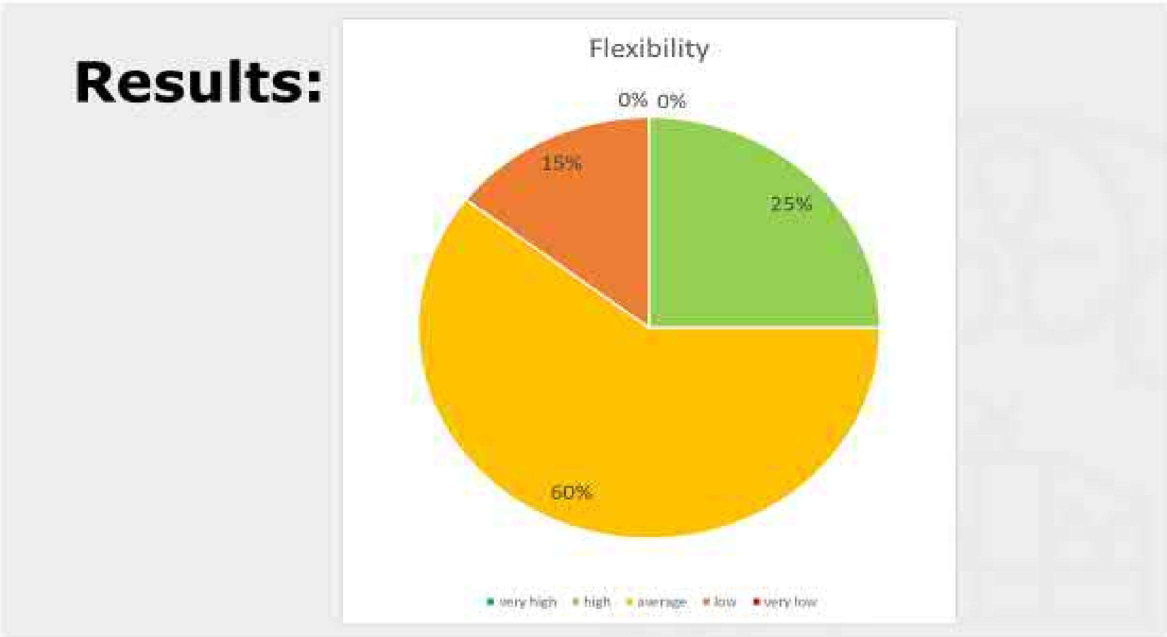
- Coping Inventory for Stressful Situations (Endler & Parker, 1999)
  - Task-oriented coping
  - Emotion-oriented coping
  - Avoidance-oriented coping
- Coping and Stress Profile (Olson, 2007). MASH model:
  - demands (stressors)
  - coping resources
  - adaptation

Results:

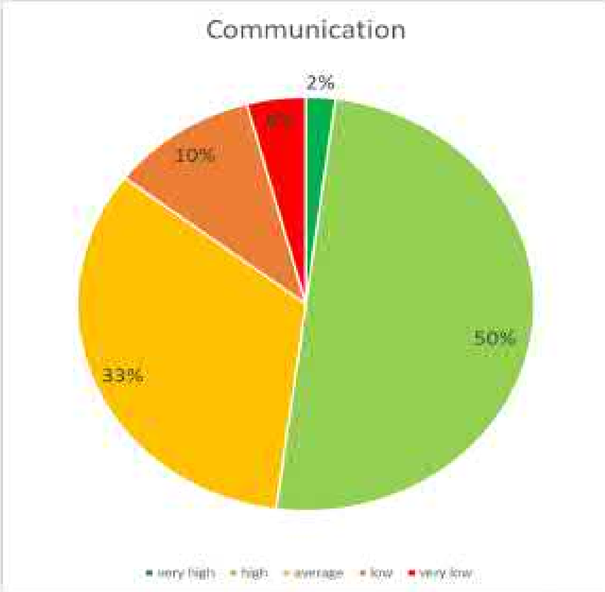


Results:


Results:
Problem solving style
0% 0%
4%
13%
83%
very high
high
average
low
very low


Results:
Flexibility
0% 0%
15%
25%
60%
very high
high
average
low
very low

Results:



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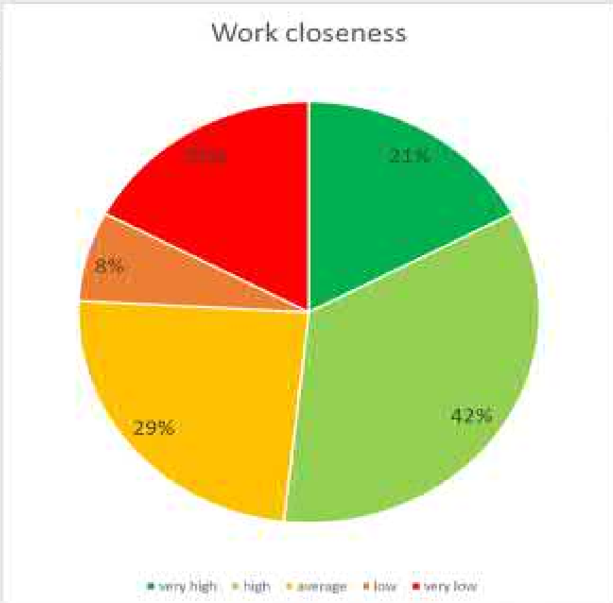

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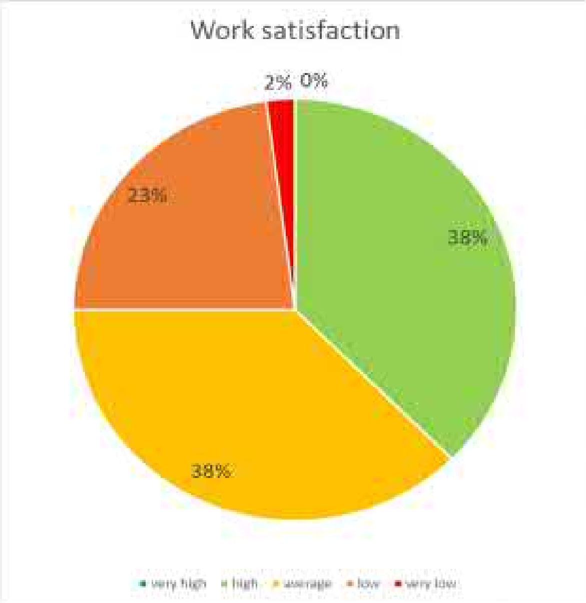

Discussion:

- The vast majority of the stock responds to stress with appropriate coping strategies
- Need more support during and after their duty hours
- Psychological analysis worth to continue
- Actions taken based on that could support longer service period, healthier and happier life for professional firefighters

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FIRE INVESTIGATION AND RESPONSE IN MURANG'A COUNTY, KENYA: SUCCESSES AND CHALLENGES
PRESENTED
BY
BILHA WANJIKU MUCHIRI,
DISASTER MANAGER, MURANG'A COUNTY
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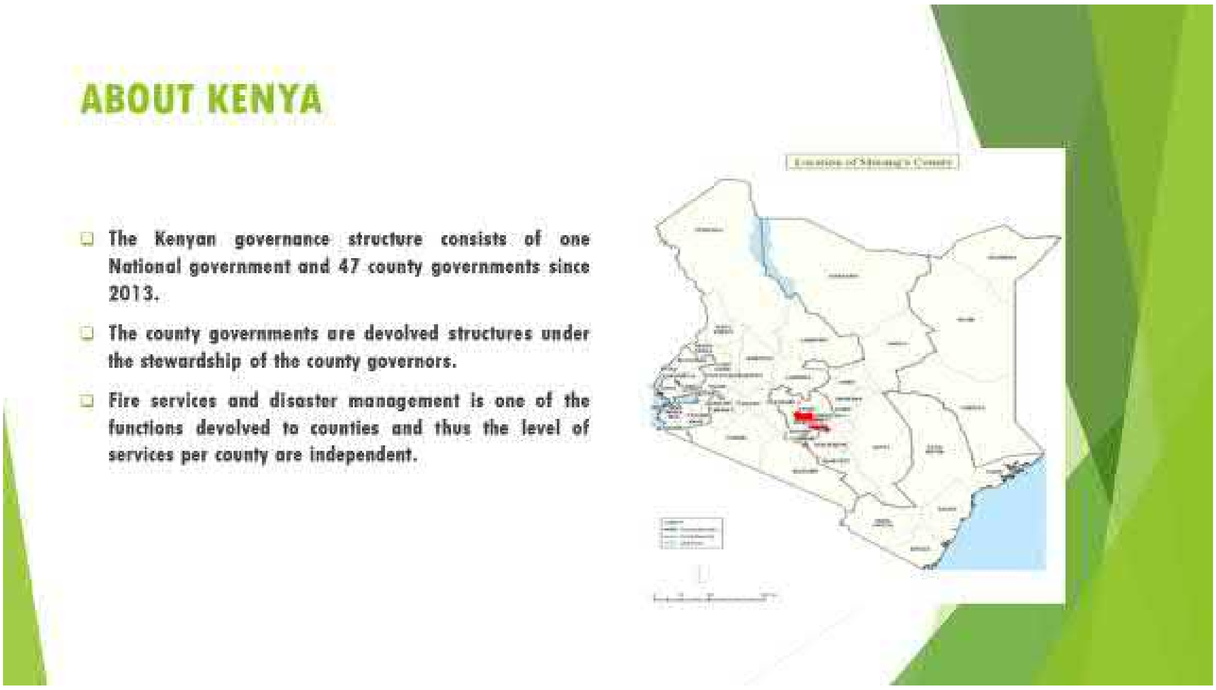
mobile:+254 722971416
MURANG'A COUNTY GOVERNMENT FIRE SERVICE
15 05 2018


ABOUT KENYA
The Kenyan governance structure consists of one National government and 47 county governments since 2013.
The county governments are devolved structures under the stewardship of the county governors.
Fire services and disaster management is one of the functions devolved to counties and thus the level of services per county are independent.

ABOUT MURANGA COUNTY

- Murang'a County is a cosmopolitan county located in the defunct central province of the Republic of Kenya.
- It borders Nyeri to the North, Kiambu to the South, Nyandarua to the West and Kirinyaga, Embu and Machakos counties to the East. It lies between latitudes 0° 34'; 1°7'South and Longitudes 36°; 37° 27' East. The county occupies a total area of 2,558.8Km^2 with a population of 1,056,640 (2019 census), and urbanization of 16.8%.

COMMON DISASTERS IN MURAN'GA COUNTY

- Although drought is one of the common disasters in Kenya, it is not very common in Murang'a county being an agricultural area.
- The most common disasters are:
- land slides given the hilly landscape of most parts of the county
- Transportation accidents (RTA)
- Structural collapse
- Fire
- Drowning

Murang'a County

Effects of 2020 MAM Rains

FIRE AS DISASTERS IN MURANGA COUNTY

- Fire is a disaster because it has potential to cause loss of life, it consumes property and degrades the environment by releasing emissions.
- A big fire can disrupt lives seriously by consuming livelihoods, misery by life loss, closure of critical facilities e.g. the Mathai supermarket fire burned for 3 days and caused a standstill in Murang'a town.
- it is worth noting that fire disasters are common in the urban settings as well as in the rural settings
- in urban settings, most fires are residential and commercial.
- Some of the residences are also rental houses and thus loss of homes and businesses
- In ,schools-either due to arsonist attacks or electrical failure,
- forest fires eg. the aberdare fire of 13/1/2017 and recurrence on 01/10/2019

THE FIRE AND DISASTER MANAGEMENT UNIT IN MURANGA COUNTY

THE FIRE AND DISASTER MANAGEMENT UNIT IN MURANGA COUNTY CONT'

- The fire services and disaster management unit was established in 2013 after devolution.
- The unit comprises of 38 personel deployed in 3 functional fire stations.
- The unit is under the county secretary, led by the disaster manager under whom are Duty Station officers, Liutenants and the technical crew in that order.
- My roles as the fire chief include; formulation of policy, preparation of budgets and annual plans, appraising the fire personnel, reporting and briefing the county government on disasters before, during and after, conducting fire investigations and training, enhancing safety compliance, infrastructural acquisition and maintenance, linking the unit with external partners and agencies eg. Other counties, national government, NGOs and international development partners.

FIRE DISASTER INVESTIGATION IN MURANGA COUNTY

- **Also called fire cause determination.**
- **It's a systematic approach for the analysis of a fire related incident to determine the probable cause of the fire**
- **In Murang'a county, the fire chief is duly responsible for fire investigation in collaboration with the fire prevention team.**
- **We also cooperate with the directorate of criminal investigation (DCI) for arson investigation and Kenya Power for electrical related incidences.**

FIRE INVESTIGATION IN MURANGA COUNTY CNT'

FIRE INVESTIGATION IN MURANGA COUNTY CNT'

- The steps for scene management have proved effective to our department.
- There's always a slight disparity when the fire unit is not called upon to respond to a scene and thus the area is not secured which exposes the evidence to tampering.
- Some victims do not call for investigation while others like Mathai supermarket called long after the fire incident, and having tampered with the evidence.
- This picture indicates a recently conducted fire investigation for Giachuki Boys High school where a dormitory was razed by an inferno.

OUR STRENGTHS IN FIRE INVESTIGATION AND RESPONSE

- We have basic fire investigation techniques to rule on the cause of the fire.
- We have basic fire fighting equipment to help us respond, 2 fire trucks, 2 Rapid intervention vehicles, and worn out regular PPEs.
- We enjoy a cordial working relationship with the county law enforcement personnel who help in ground control, apprehension of non-compliant citizens.
- We have a young, vibrant and enthusiastic fire fighting **crew trained up to level 3 & 4 certificates.**

COLLABORATORS

We enjoy functional collaborations with;

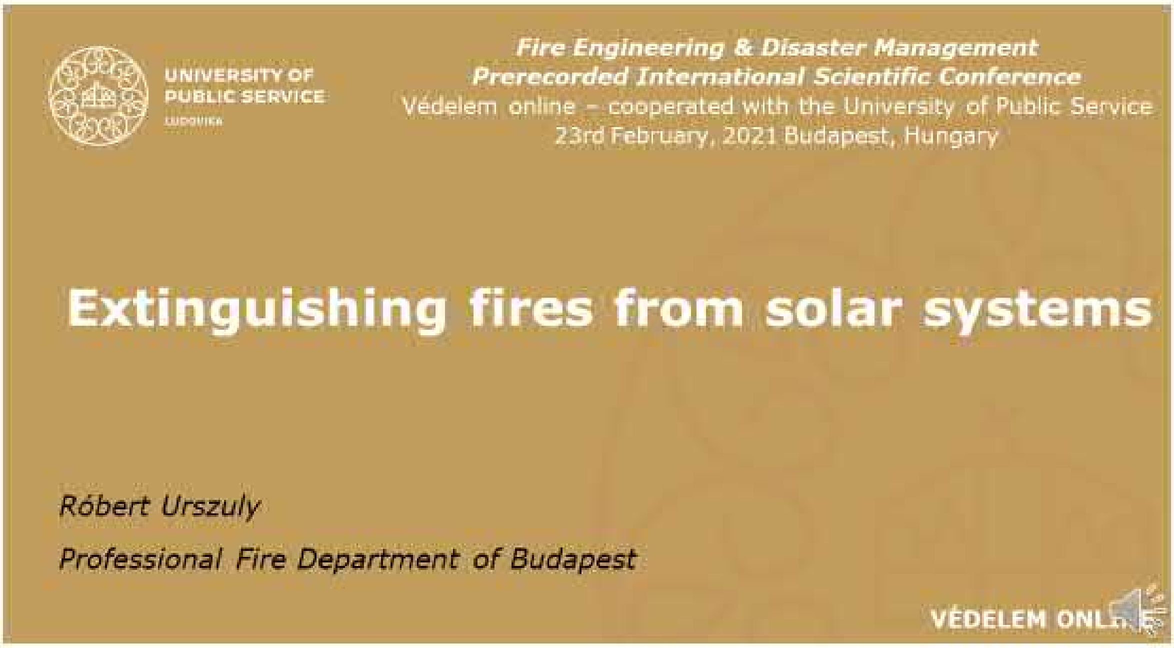
- Other county fire brigades,
- The national government,
- Polish Centre for International Aid (PCPM),
- Africa Fire Mission (AFM)
- Kenya Red Cross.
- **We are looking forward to collaborate with the Hungarian University of Public Service and any other development agency.**

WEAKNESSES/ CHALLENGES

- Lack of advanced training for most of the firefighters
- Inadequate fire fighting equipment
- Lack of expertise in fire equipment maintenance and repairs.
- Lack of equipment and expertise in HAZMAT and fire investigation.
- lack of capacity to conduct hazard mapping.

OUR DESIRE

- To solicit for opportunities for capacity development of the existing fire fighting men and women within the unit. Training in basic fire engineering would be a welcome move towards realizing this desire
- Fully equip the fire and disaster management unit so as to be able to respond to the ever emerging disaster concerns in the county and beyond… it is important to note that our unit is one of the best in the central region such that whenever there are disasters in the neighboring counties including Kirinyaga and Nyeri, our unit is always called upon to support other county disaster units
- To develop our disaster unit to a model disaster response center which can be used a disaster training center for the entire central region and beyond. This means that the unit can be developed to become a modern training center on practical disaster management skills through use of technology such as drones, thermal imaging devices in structural fire and delsar life detectors for collapsed buildings.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23rd February, 2021 Budapest, Hungary
Extinguishing fires from solar systems
Róbert Urszuly
Professional Fire Department of Budapest


Introduction of the author
Workplace: Professional Fire Department of Budapest No VIII. Fire house
Position: Firefighter
Studies
2018-2021 BA studies (specialization for Fire Protection and Rescue Operations Management)
Contact
urobi87@gmail.com

Contents of the presentation

- **Abstract** – a short introduction of the topic
- **The solar system–** system operation, installation
- **The solar panel –** short presentation of the types of solar panels
- **System faults and hazards –** fires and interventions hazards
- **Options for interventions**
- **Summary -** Results, ideas
- **References**

Abstract

- Firefighters face unexpected challenges with the growth of new uses for alternative energy. These renewable energy sources save on the use of conventional fuels such as oil and other fossil fuels, but they carry unknown hazards themselves, requiring new firefighting strategies and procedures.
- These alternative energy use conditions include buildings equipped with solar energy systems that pose a number of significant hazards in the event of a fire. The article covers solar systems utilizing solar panels that generate heat and / or electricity and focus on the structural firefighting of buildings and structures, in particular solar panels used to generate electricity.
- However, before we go any further, I would like to briefly describe a relatively common installation format:

Solar panel:

- To convert sunlight into direct current

Inverter:

- To convert the produced direct current into a networkable alternating current

Measuring:

- To account for electricity produced and consumed

HOW THE SYSTEM WORKS

- Survey
- Design
- Execution

What is solar cell?

The material of the solar cell has a crystalline structure with a uniform interior shows a spatial layout. Typically, a silicon raw material is used for production, which becomes at the end of a process of complex technological chains can be used as a final product.

ERRORS AND DANGERS INHERENT IN THE SYSTEM

- Material error
- Execution error

→ Fire damage

↓

Intervention, additional danger

CAUSES OF FIRE

- In the event of direct current and insulation faults, permanent, bright curves can form
- The connection boxes of the solar cells must be de-energized at the connection of the main DC line
- Installation can only be carried out in dry conditions with dry tools

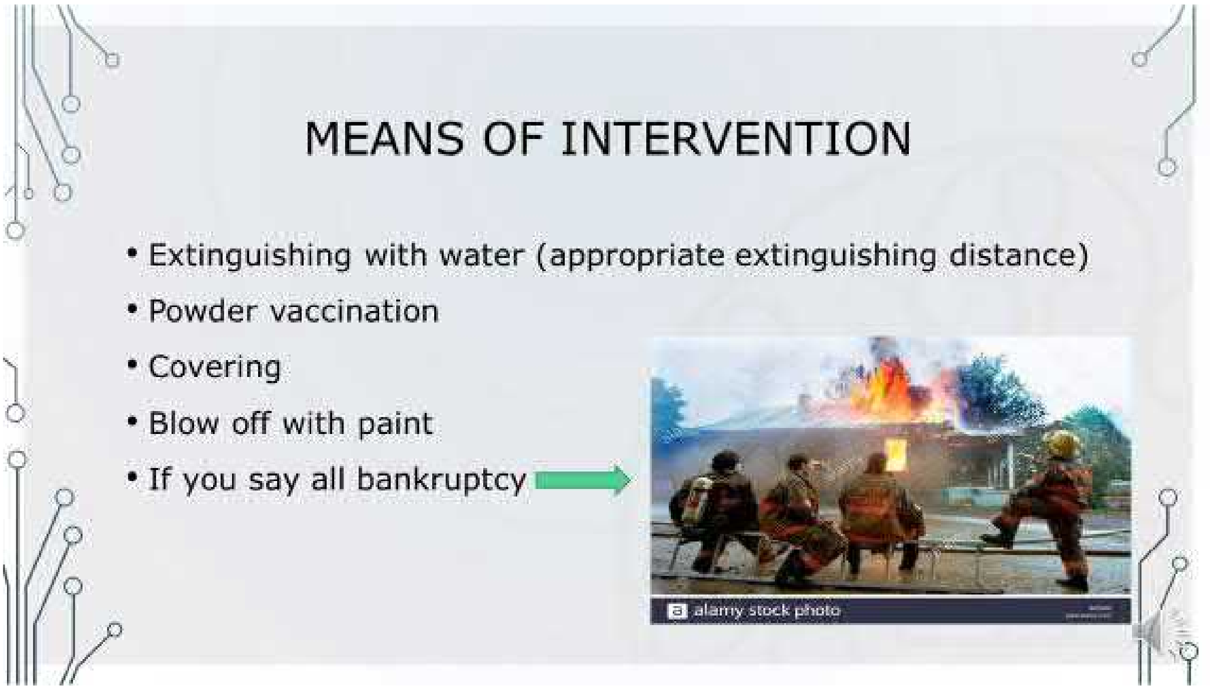

Lichtbogen bei 200 V Gleichstrom

ACHILLES HEEL OF THE SOLAR PANEL

- In the event of a roof fire, the back of the solar panels is moderately or not at all fireproof.

DANGER TO INTERVENERS

- Risk of electric shock!!!
- Falling off the roof
- Work at height
- Debris falling
- Mechanical damage during finishing
- Toxic flue gases


MEANS OF INTERVENTION
• Extinguishing with water (appropriate extinguishing distance)
• Powder vaccination
• Covering
• Blow off with paint
• If you say all bankruptcy
alamy stock photo


IDEAS?

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Thank you for your attention !


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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Firefighter responses in case of railway accidents
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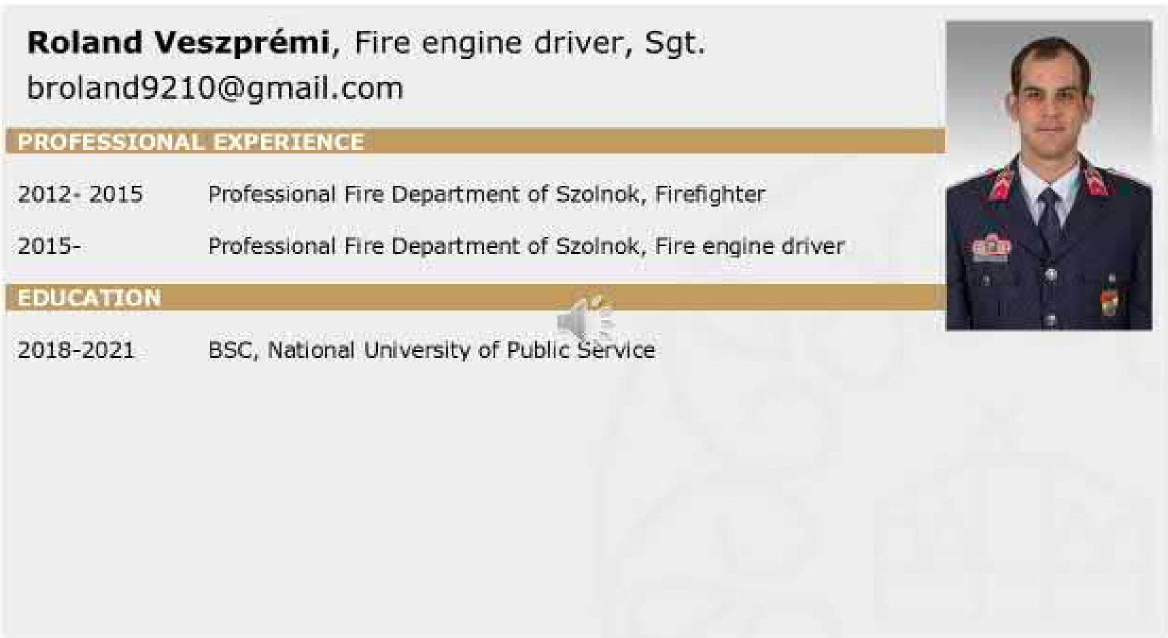
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PROFESSIONAL EXPERIENCE
2012- 2015 Professional Fire Department of Szolnok, Firefighter
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Péter Pántya began his studies in 2003 at the Tessedik Sámuel College (BSc degree in human affairs) later continue at the Miklós Zrínyi National Defence University (MSc an BSc) for Defence Administration Organizer (Disaster Management, Fire Protection and Firefighter) He began his PhD studies in 2008 at the Doctoral School of Military Engineering at the Miklós Zrínyi National Defence University. He is currently an associate professor at the Institute for Disaster Management of the Faculty of Law Enforcement at the University of Public Service.

He is also have a habilitation.

His research topics are: fire and disaster management actitivities, technical equipment, and the raising of the efficiency of the fire organisations at the incidents.

Structure of the presentation

1. Abstract of the presentation
2. Methods of the investigation
3. Demonstration of the results
4. Conclusions and Discussion about the issue of firefighter responses in case of railway accidents
5. List of the references used for this presentation

Abstract

The investigation aims to explore the problems that arise during the intervention of the fire brigade in railway accidents and its possible solutions.

The basic accident environment, the fire-fighting forces available in the interventions and their equipment, as well as the possibilities that can help the railway damage elimination are presented.

A feasibility study of new technical and organizational solutions will also be presented, which will make fire brigade interventions more effective and faster in this area.

Methods

For the study, the relevant Hungarian legal regulations were reviewed and the domestic and international literature was reviewed also.

Personal consultations were held on both professional sides, fire brigade and railway expert side. The experts of railway was fire expert, plant engineer, accident prevention unit , overhead professional service.

The experts of fire, disaster management side was the general firefighting sphere, an incident commander of a railway accident, members of operations control, fire subordinate staff.

Results

Reconsider Electric Shut down protocol

Special cutting equipment

Medical Capability

Organization
[1] [2] [3]

Problems of the railway environment

Lack and importance of information

A large number of injured people

Accessibility and orientation issues

Delayed electric shut down

Technical challenges

Lack of assets

Fire staff shortage [4] [5]

Problematics of verified shut down

Regulations, verified shut down
(electric disconnection and grounding)

Location of substations

Needs for special tools

Needs for professional staff and experts

Earthing (hazards, voltage)

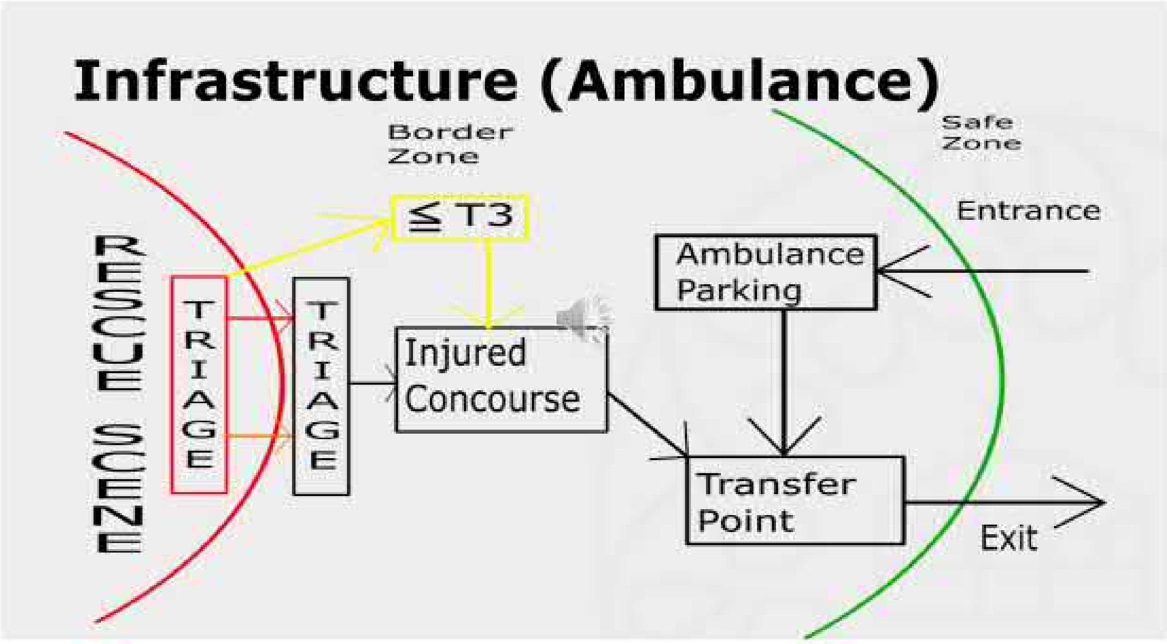
Technical challenges

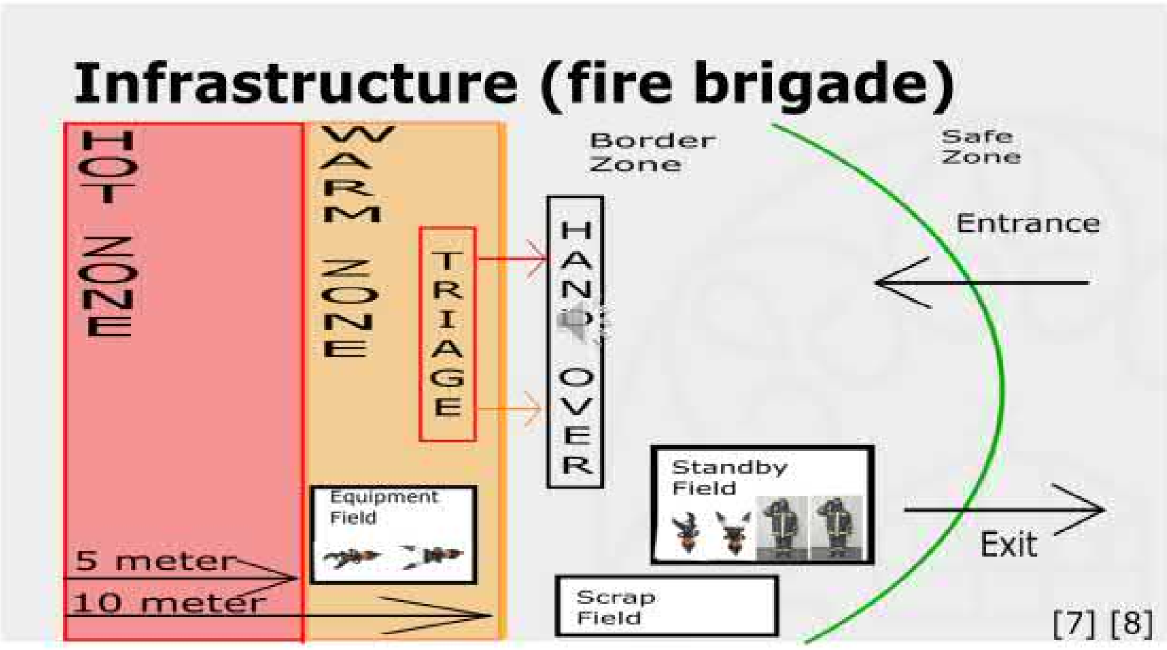
Thickness of the different materials

The need for continuous cutting of plates

Overhead lines

Higher working height than usual
[6] [7] [8]


Infrastructure (Ambulance)
Border Zone
Safe Zone
RESCUE SCENE
TRIAGE
TRIAGE
≤ T3
Injured Concourse
Ambulance Parking
Entrance
Transfer Point
Exit


Infrastructure (fire brigade)
HOT ZONE
WARM ZONE
Border Zone
Safe Zone
TRIAGE
HAND OVER
Entrance
Equipment Field
Standby Field
Exit
5 meter
10 meter
Scrap Field
[7] [8]

Discussion, Conclusions

Place grounding rods for trains [9]

Information, „ÖTRA”, GPS Navigation

Create the right infrastructure

Special cutting equipment

„Disaster Medic”

[9] [10]

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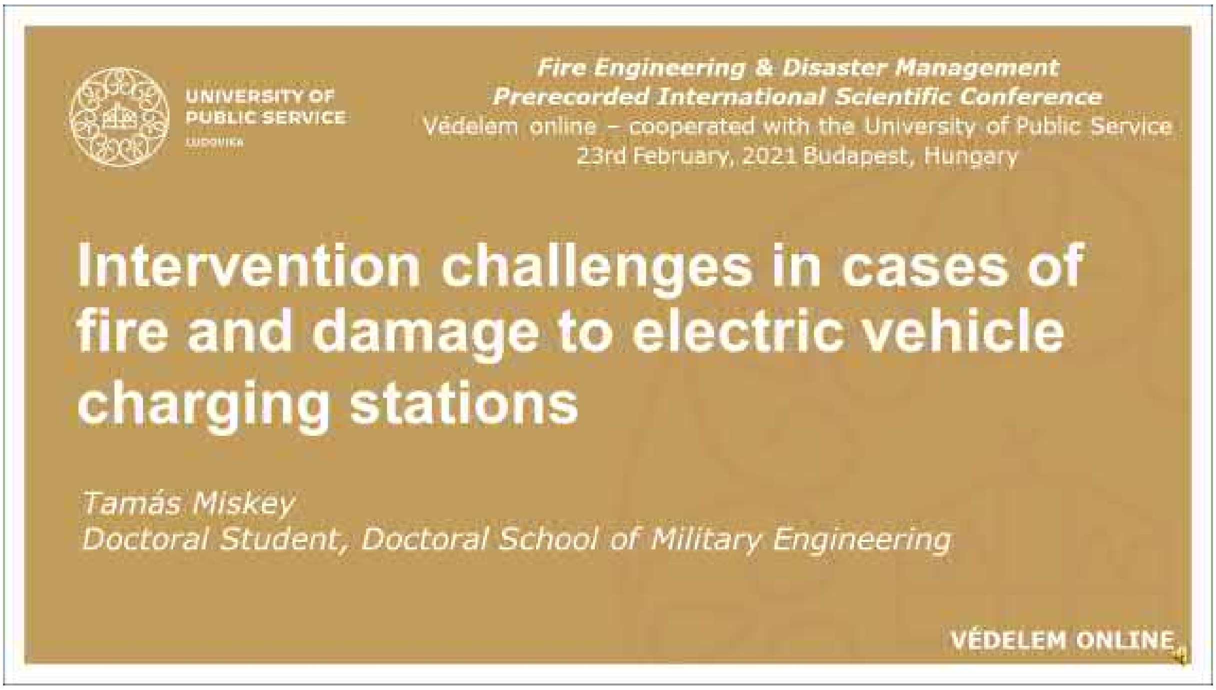
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Intervention challenges in cases of fire and damage to electric vehicle charging stations
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VÉDELEM ONLINE


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Research topic
Firefighting and intervention challenges at high altitudes and in special conditions
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Contents of the presentation

- Abstract
- Introduction
- Identification of challenges
- Types of charging stations
- Risk of intervention
- Separating the charging stations
- Conclusion
- References

Abstract

Proliferation of electric and hybrid vehicles

As firemen, we also must follow technological developments. In addition to electric cars, similarly-propelled public transport vehicles, motorbikes and trucks have also appeared.

Electric charging stations

With the proliferation of electric and hybrid vehicles, the number of charging stations is also increasing rapidly. These are a potential hazard for intervening firefighters.

Introduction

Unique situations for intervening firefighters

- A vehicle at the charging station is on fire.
- A vehicle that is not charging but is near a charging station is on fire.
- A charging station or a vehicle connected to it is involved in a road accident.
- A vehicle must be removed from the charging station due to damage.

Identification of difficulties

- Each service provider uses a different design
- No contact person is provided
- The particular service provider is not available
- The operating local specialist is not on site

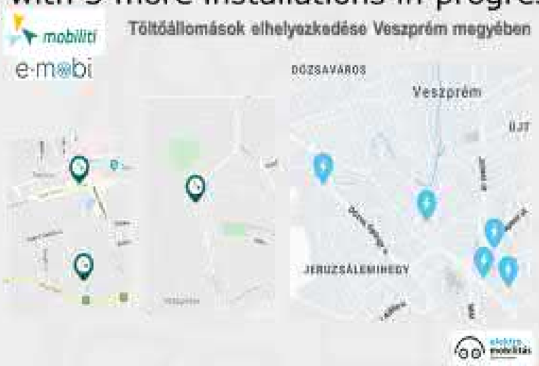
Types of charging stations

AC(alternating current) 22 kW | **DC (direct current) 22 kW** | **AC/DC 50 kW (fastcharger, circa in 45 min to 80 %)**

Connector	Type2	CHAdeMO CCS	Type2	CHAdeMO CCS	CHAdeMO CCS Type2
Charged at the same time	2 autó	1 autó	2 autó	1 autó	2 autó
Performance	2×22 kW	50 kW	2×22 kW	22 kW	50 kW
Output current	AC	DC	AC	DC	DC + AC

Charging stations in Veszprém

Charging stations
14 stations already in operation, with 3 more installations in progress



Service providers
- EON (e.g. Aldi)
- E MOBI-MOBILITI
- EvoPro
- VKSZ-MVM
- POLYFAZER-V4Plus Kft.

Risks of intervention

- Working under voltage
- Voltage cut-off by the electricity supplier
- Key to the charging station for internal voltage relief

Separation of charging cables

mobiliti

e·mobi

Töltőkábelek reteszelése – autó töltése

DC töltőcsatlakozók esetén

- a kábel a töltőállomás része,
- az autó felöli vége mechanikusan reteszelt a töltés alatti kihúzás ellen. A retesz a töltés leállításával nyitható. Kábelben DC áram! (DC ív!)

AC töltőcsatlakozók esetén

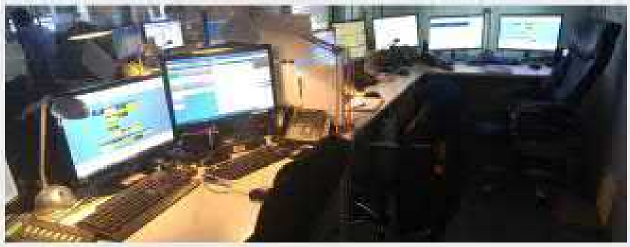
- a kábel az autótulajdonosé
- a kábel autó felöli és töltő felöli vége is mechanikusan reteszelt a töltés alatti kihúzás ellen. A retesz a töltés leállításával vagy a töltő felnyitásával mechanikusan egy kis kar segítségével nyitható.

Az elektromos töltőberendezés és a hozzá csatlakoztatott kábel az áramszolgáltatói feszültségmentesítés elvégzéséig feszültség alatt állónak tekintendő !!!

elektro mobilitás

Conclusion

- Regular, specialized trainings for the intervention staff
- Organizing "local knowledge" exercises in cooperation with the electricity supplier
- With the above in mind, the development of the PAJZS and Kap-Online systems in the operations control departments



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Forest wildFire crisis Management
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Contents :

Abstract :

Forest wildfire is an issue that has a worldwide concern, its management is taking a sort of firefighting measures rather than tackling fire symptoms at early stages. This approach in almost all cases has proven its failure in reducing the extent of damage. UAV's in future will play a vital rule in detecting the fire initiation symptoms or fire at early stages ,that would make firefighting economically feasible.

Fire in History & Culture:

- Evidence for controlled use of fire by *Homo erectus*, beginning some 1,000,000 years ago
- Fire is viewed by Christians, the Chinese, and the Hebrews as being a symbol of divinity
- Many cultures view fire as a symbol of wisdom and knowledge
- The lake of fire appears in both ancient Egyptian and Christian religion as a place of after-death punishment of the wicked, similar to Islam's Hellfire

United States of America

- 2020: about 57,000 wildfires compared with 50,477 in 2019
- More than 42,000 km^2 were burned in 2020, compared with 19,000 km^2 in 2019
- The federal Government spent over $3 Billion on fighting wildfires in 2018

Australia

- 186,000 km^2 burnt , i.e. twice Hungary (Jordan) area
- An air tanker , 2 helicopters crashed ,and 2 fire trucks were caught in fatal incidents
- Fire-hawks; it was noticed by many that these birds spread fires, (unknown if this is done intentionally or unintentionally)
- Strange to note that, this bird is one of five animals that you are allowed to kill as per Islamic religion

Canada

- On average wildfires burn 25,000 km^2/year
- Lightning usually causes more than half of the wildfires
- University of Alberta wildland fire professor Mike Flannigan says :
  - "Climate change's fingerprints raising wildfire risk in Canada and the world.
  - "The warmer it is the longer the fire season"
  - "Every degree of warming, the number of lightning strikes goes up by about 12 %"

Jordan

- In 2020 , fire destroyed 40 Km^2 agricultural crops, 179 Km^2 of dry weeds area.
- Forestry is 821 km^2 (0.09% of Jordan)
- Corona pandemic shutdown , the main cause for not letting Sheppard's move and graze their cattle after the spring season , hence a lot of dry weeds and grass especially near forestry areas.
- Carelessness , and deliberate fires to harvest woods as a source for heating are the main causes.

Fire Crisis Techniques

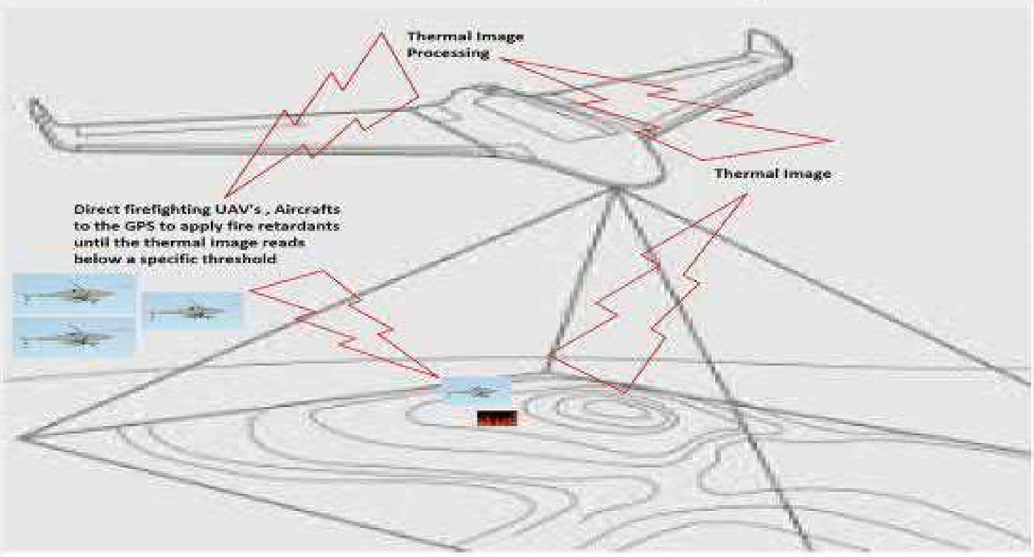
- **Preventive:**
  - Firebreaks
  - Prescribed fire
  - Controlled animal Grazing
  - Personal patrols
- **Corrective**
  - Fire-fighting trucks
  - Aircraft(Fixed-wing, Helicopters)
  - Fire fighters
  - Local People

Beriev Be-200 filling water tanks in the Mediterranean Sea while in operation in Mount Carmel forest fire in Israel

Future Fire Crisis Techniques

- **<u>Preventive:</u>**
  - **Solar powered UAV's equipped with thermal sensors**
- **<u>Corrective</u>**
  - **Aircraft(Fixed-wing, Helicopters)**
  - **UAV's fire-fighters**

Future Fire Crisis Techniques



Conclusion

- Its more critical to work on preventive measures rather than on corrective ones in case of wildfire
- Second priority is to reduce the response time for corrective measures , where UAV,s use would help in that regard and dramatically reduce the extent of damage.

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Section D – Disaster management


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The 20 years of the Hungarian Disaster Management
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Serve 25 years for the Hungarian Army. Assigment: commander garrison of town Zalaegerszeg
After the Army join to the Hungarian Civil Protection. 2000 - county director of HDM
2002-2010 Deputy Director General for Emergency Management of NDGDM, and commander of Operationel Staff of Govermental Cordination Committe
2010-2011 director of Disaster Management Training Centre of NDGDM
2012- assistant university professor of NUPS in Institut of Disaster Management
2020- honorary university professor
PhD degree: at the Nationale Defence University in Budapest. Researches: Hungarian Disaster Manegement on country and county level

Content of the presentation

- Abstract
- Introduction of the presentation
- Methods
- The components of Hungarian Disaster Management
- The tasks of authority
- Basic elements
- The SEVESO II. Directive in the Hungarian legislation system
- The tasks of new Directorate General for Disaster Management
- The organizational structure of NGDGM
- 2012 - Modernise of the Hungarian Disaster Management
- Conclusions
- References

Abstract

- The Act No. LXXIV. of 1999 on the „Direction and Organisation of Disaster Protection and the Protection Against Serius Accidents Related the Hazardous Materials" entered into force 20 years ago.

- The establishment of the Act composed the new, modern, applicable Hungarian Disaster Management.

- In recent years the Disaster Management has been renewed both conceptionally and in relation, has been accessed the European norms.

- **The author intends to address the issue of circumstances of establishment of HDM, and achievements his operations.**

Introduction of the presentation

- The **Act No. LXXIV. of 1999** on the „Direction and Organization of Disaster Protection and the Protection Against Serious Accidents Related to Hazardous Materials" entered into force on the 1st of January 2000.
- The establishment of the Act is a result of the political, economical and social processes.
- It was important for the law enforcement organizations to meet the EU and NATO expectations.

Chosen methods for my research

- research of legally requirements
- review of literatures study
- investigation of internal regulation of NDGDM
- collection of knowledge of operations of disaster management
- comparing of standards of external and internal, foreigner and home level
- gain experiences of planning of managing work, of civil protection, firefighters and industrial safety
- handle of the disaster management changes in terms of legal requirements and technical solutions

The components of HDM

- The **NDGDM** was established with the integration of the **National Headquarters of the Civil Protection** and the **National Headquarters of the State Fire Service**.
- The **Civil Protection** in Hungary reflected the European concept, in the sphere of the environment protection, disaster prevention, and elimination, nuclear safety and the protection of the population and property
- The **State Fire Service** was replaced by the fire brigades of the local governments in 1996. The primary intervention became the responsibility of the local level. The state tasks of the Fire Service were primarily the professional direction, fire prevention, fire investigation, training, education and the setting up of technical equipment and the performance of authority activity

The tasks of authority

- The Act determines the rigorous tasks of **each authority** and state administration
- The Act determines and separates the tasks and responsibilities of the:
  - **Government,**
  - Governmental Coordination Committee,
  - Minister of Interior,
  - Competent Minister and the leader of organs with national sphere of authority,
  - Chairmen of the defence committees of counties and the Capital, and
  - the Mayors.
  - The Government has been authorized to activate civil protection organizations on disaster stricken areas.

Basic elements:

- Hungarian Disaster Management has been **subordinated** to the Minister of Interior.
- **Objective**: to protect life, property of people, social safety and economy, integrated into the security system of the country, to efficiently prevent threats, to rapidly respond and eliminate consequences.
- **Basic elements:**
  - all hazard approach and involving the entire society,
  - integrated unity of prevention, response and recovery,
  - provision of conditions proportionate to real hazards,
  - targeted planning and preparedness,
  - subsidiary and the municipality system.

The SEVESO II. Directive in the Hungarian legislation system

- In order to build the **SEVESO II. Directive** in the Hungarian legislation system the Act deals in separate Chapter with protection

  -against major accidents involving hazardous materials

  -determined the technical tasks of prevention and the mitigation of the

  damaging impact of accidents and measures

  -aimed at the protection of the population

- The state defines the order of covering the **expenses** of disaster protection.

The tasks of new Directorate General

- The Act No. LXXIV. of 1999 determined to establish, from the organs of the Civil Protection and the State Fire Service **an integrated disaster protection organization** - consisting of central, regional and local organizations.
- The central organization: the National Directorate General for Disaster Management, Ministry of Interior.
- Main **tasks** of NDGDM:
- To determine professional requirements of prevention, rescue work and disaster protection and direct and control of the work of the subordinate organizations
- To participate in the prevention and elimination of nuclear accidents and consequences of natural and industrial disasters
- To fulfil authority, special authority and expert tasks, establish of international cooperation

The organizational structure of NGDGM

- The Directorate General functioned in a structure including **authority**, **emergency management, economic** and **administrative** organization.
- The Department for Human Resources and Labour Affairs,

  -the Department for International Relations,

  -the Department for Public Relations,

  -the Section for Legal Affairs,

  -the Section for Financial Control and

  -the Section for Classified Administration were directly subordinated to the Director General
- The tasks of the elimination and management of emergencies occurred, the recovery and reconstruction were performed by a joint organization, the **organization of Deputy Director General of Emergency Management** - led by me.

The modernize of Hungarian Disaster Management

- **Modernise** of the Hungarian Disaster Management has began in 2012, when the Act No. CXXVIII. of 2011 on the „Disaster Management and amending certain related laws" entered into force.
- The modernise was established on the experiences of last 10 years, and on experiences of red mud disaster in 2010.
- The civil protection has been renewed, the Fire Service has been subordinated directly to the Disaster Management, as the state Fire Service and the new Industrial Safety Service has been realized.

Conclusions

- **Precedents** of the establishment of the professional disaster management organisation:
- To execute NATO and EU requirements,
- Civil protection: adaption of European norms,
- establishment of municipal fire brigades,
- promotion of the significance of civil emergency planning,
- the occurrence of migration and humanitarian tasks,
- significance of civil security.

References

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- Act No. XXXI. of 1996 on Fire protection and Rescue
- Act No. XXXVII. of 1996 on Civil Protection
- Act No. CXXVIII of 2011 on disaster management and amending certain related laws (the 2nd Act on Disaster protection)

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Zoltán Török – Alexandru Ozunu – Cristian Malos – Andrei Radovici: *Natech Risk at Romanian Seveso establishments and industrial parks*

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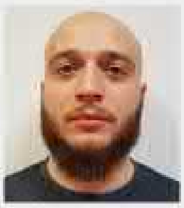

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Environmental scientist, GIS and remote sensing expert

Scope and Objectives of the study

- The study **aims** to create an inventory of the locations of SEVESO establishments and Industrial Parks in order to identify the degree of their exposure to earthquakes, floods and forest fires.

- **Objective:** to select those sites with the highest NaTech potential and prioritize for risk mitigation measures.

Romania – Landmarks, main natural hazards

Figure 1. Geographic map of Romania

Romania – Landmarks, main natural hazards

- The main natural and hazards and related risk identified in the national risk assessment (RoRisk Project – 2016):

Forest fires	Avalanches	Destructive geological phenomena		Dangerous hydrometeorological phenomena					
		Earthquakes	Land slides	Storm Sand blizzard	Floods	Heavy snow	Tornadoes	Drought	Extreme temperatures
1	2	3	4	5	6	7	8	9	10

Table 1. Main risk sectors identified for Romania – Country Report - Romania, 2016

Romania – Landmarks, main natural hazards

- Seimic hazard:

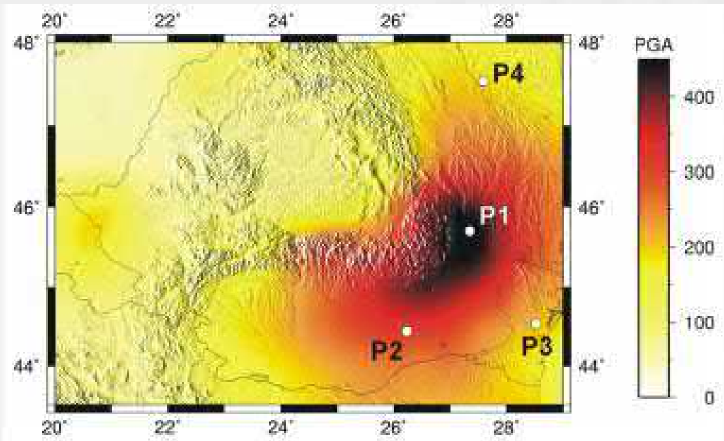

Figure 2. Probabilistic seismic hazard map of Romania - Return period of 475 years (Sokolov et. al, 2007)

Romania – Landmarks, main natural hazards

- Flood hazard:

Figure 2. Flood hazard map of Romania - Return period of 500 years (Dottori et. al, 2016)

Romania – Landmarks, main natural hazards

- Forest fires hazards:

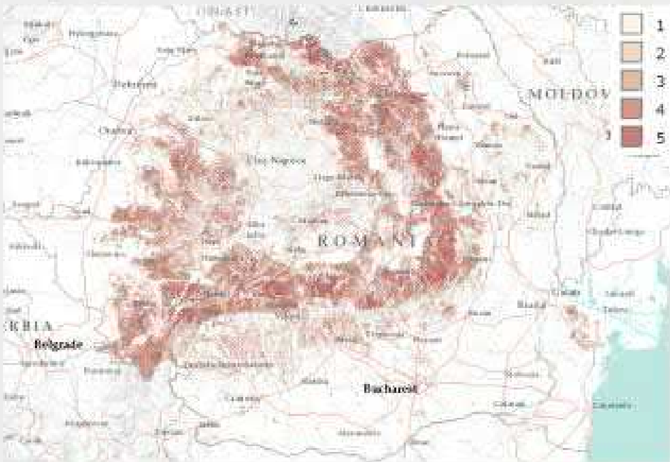

Figure 3. Forest fire hazard map of Romania - Return period of 1000 years (Rorisk GIS portal)

Figure 4. Industrial parks in Romania (map created by the authors, based on the information from Ministry of Development, Public Works and Administration, 2021)

Figure 5. Seveso sites in Romania (map created by the authors, based on the information from RoRisk project, 2016)

Industrial parks and Seveso sites in NaTech prone areas

- Seismic hazard:

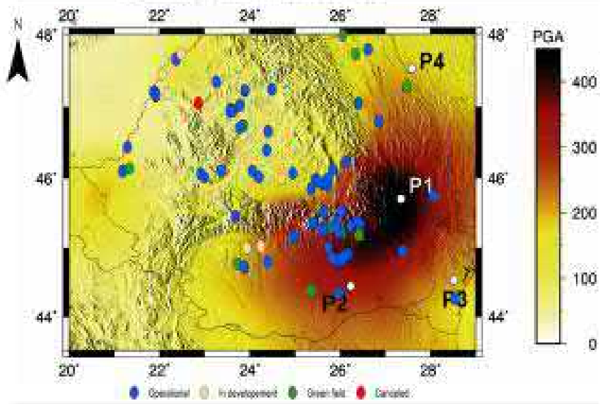

Figure 6. Industrial parks in earthquake prone areas

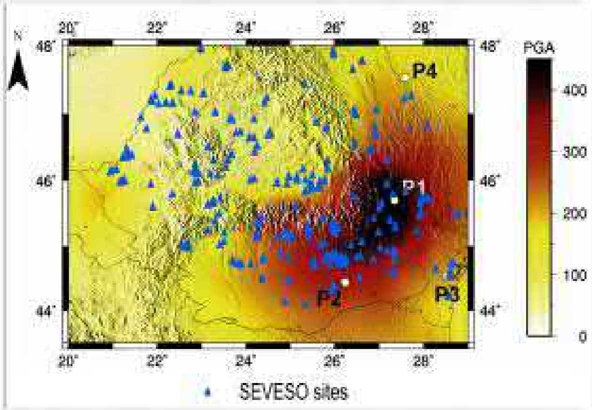

Figure 7. Seveso sites in earthquake prone areas

Industrial parks and Seveso sites in NaTech prone areas

- Flood hazard:

Figure 8. Industrial parks and Seveso sites in flood prone prone areas

Industrial parks and Seveso sites in NaTech prone areas

- Forest fire hazard:

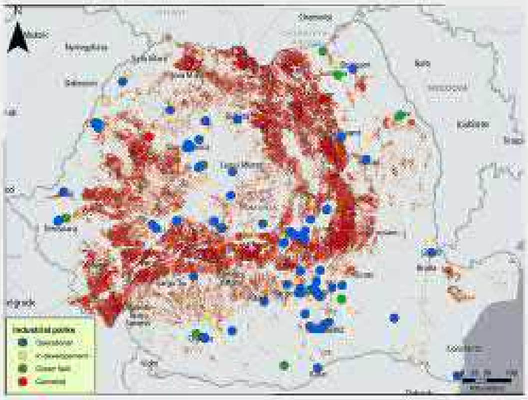

Figure 9. Industrial parks in forest fire prone prone areas

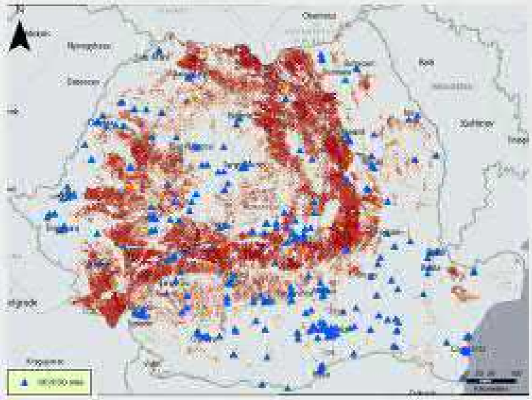

Figure 10. Seveso sites in forest fire prone prone areas

Conclusions

- A first inventory of Seveso establishments and Industrial Parks in natural hazard prone areas was developed using GIS technique.
- From the three main hazards considered in the study, seismic hazard involves the highest number of the establishments, presenting the highest NaTech potential.
- The study can be a first step in the selection of sites for a more detailed NaTech risk assessment and prioritization of prevention measures.

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Transport of materials belonging to ADR Class 3 with agricultural tractor in Hungary
Csaba Sándor, Almási assistant lecturer
Lajos, Kátai-Urbán, associate professor, head of Department of Industrial Safety
Gyula, Vass, associate professor, director of Institute of Disaster Management
University of Public Service, Institute of Disaster Management, Department of Industrial Safety
VÉDELEM ONLINE


Short introduction of authors
Gyula, Vass, associate professor, Director of Institute of Disaster Management
Lajos, Kátai-Urbán, associate professor, Head of Department of Industrial Safety
Csaba Sándor, Almási assistant lecturer

Abstract

- In 1979, Hungary enacted the (European) Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR).
- Besides the domestic application of the Agreement, it may be necessary to develop detailed rules adapted to the security needs of the country concerned.
- Therefore, in 2004, Hungary prescribed the first regulation on transport operations by vehicle types not covered by the Agreement, agricultural tractors and slow-moving trailers.

Problem in terminology 1

- The term of vehicle 1
- AGREEMENT CONCERNING THE INTERNATIONALCARRIAGE OF DANGEROUS GOODS BY ROAD (ADR)
- Article 1 a): „the term "vehicle" shall mean motor vehicles, articulated vehicles, trailers and semi trailers, as defined in article 4 of the Convention on Road Traffic of 19 September 1949, other than vehicles belonging to or under the orders of the armed forces of a Contracting Party”

Problem in terminology 2

- The term of vehicle 2

- DIRECTIVE 2008/68/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 September 2008 on the inland transport of dangerous goods, Article 2, Definitions:
- „4. 'vehicle' shall mean any motor vehicle intended for use on the road, having at least four wheels and a maximum design speed exceeding 25 km/h, and any trailer, with the exception of vehicles which run on rails, mobile machinery and agricultural and forestry tractors that do not travel at a speed exceeding 40 km/h when transporting dangerous goods"

ADR 2.2.3
Class 3 Flammable liquids

"The heading of Class 3 covers substances and articles containing substances of this Class which:

- are liquids according to subparagraph (a) of the definition for "liquid" in 1.2.1;
- have at 50 °C a vapour pressure of not more than 300 kPa (3 bar) and are not completely gaseous at 20 °C and at standard pressure of 101.3 kPa; and
- have a flash-point of not more than 60 °C (see 2.3.3.1 for the relevant test)"

The Hungarian solution for agricultural tractors

In the Hungarian legal system:

- 7/2011. (III. 8.) NFM ministerial decree on the road transport of agricultural chemicals and fuels by agricultural tractor or slow - moving vehicle towing a trailer
- („NFM": Ministry of National Development, today: Ministry of Innovation and Technology)

Plant protection products shall only be delivered in packages

- Pesticides and liquid fertilizers, diesel fuel shall only be delivered in packages
- Exception: Liquid fertilizer and diesel fuel in packages, shall only be transported in a tank if you have a certificate of approval according to ADR 9.1.3.5

Inscriptions in Hungarian are required for the trailer

- A plate bearing the words "AGRICULTURAL CHEMICAL" (in Hungarian: „**MEZŐGAZDASÁGI VEGYSZER**") shall be affixed on both sides and at the rear of the trailer carrying non-flammable plant protection products and fertilizers.
- A plate bearing the words "AGRICULTURAL CHEMICAL" + "FLAMMABLE" (in Hungarian: „**MEZŐGAZDASÁGI VEGYSZER**" + „**TŰZVESZÉLYES**") must be placed on both sides and at the rear of the trailer carrying flammable plant protection products and fertilizers.
- A sign clearly marked "FLAMMABLE" (in Hungarian: „**TŰZVESZÉLYES**") must be affixed to both sides and at the rear of the trailer carrying diesel fuel.

Diesel fuel (IBC) on a trailer

IBC: intermediate bulk container

A sign clearly marked "FLAMMABLE" (in Hungarian: „**TŰZVESZÉLYES**") must be affixed to both sides and at the rear of the trailer carrying diesel fuel.

Diesel fuel (IBC) on a trailer

- The package shall be secured in the same manner as specified in the ADR

Diesel fuel (IBC) on a trailer

- The marking and labelling required by the ADR Chapter 5.2, are not required for the packages

Missing the same labelling on the side of the trailer (infringement)

Pesticides in tank

- Plant protection product, pesticides shall not be transported in a tank, mixed with water.
- Control of mixing into water can now be carried out relatively easily with the help of the sampling and hazardous substance identification capabilities of the CBRN Laboratories (called "KML") of professional Disaster Management bodies.

HazMat in the cab

- Hazardous materials, pesticides shall only be placed on the trailer

Infringement

Conclusion

- Safe road transport of dangerous goods is guaranteed by compliance with the ADR Convention, drawn up by a specialized body of UN Economic Commission of Europe, which was ratified by Hungary as well.
- The domestic implementation of the regulation also covers the transportation of dangerous goods by agricultural tractors.
- The protection of soil and water assets has a high national economic importance, therefore the feedback and continuous professional cooperation of authorities with agri-industry operators is vital.

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Mikulas Monosi - Flachbart Jaroslav: *Drone application in extreme conditions*

Assoc. Prof. Eng. Mikuláš MONOŠI, PhD.

- The aim of his specialized science research activities is the reliability of fire-fighting equipment.
- Appropriate solution of engineering (technical support) during emergencies, the multiple-criteria.
- Evaluation of fire-fighting equipment and assessing of the equipment to use for forest fires.

Eng. Jaroslav FLACHBART, PhD.

- He specializes in the management of rescue units.
- Fire protection and fire investigation.
- Designs simulation devices for firefighter training.

Contents of the presentation

- Abstract
- Methods
- Equipment for experiments
- Partial result No. 1 - 4
- Discussion and recommendations
- References

Abstract

- The Fire and Rescue Corps (F&RC) will upgrade its equipment. Drones quickly and effectively monitor the area of intervention. F&RC bought two drones from DJI Mavic 2 Pro.
- Pilots may encounter various undesirable circumstances that affect the functionality of the drone.
- The main goal of the research was to experimentally test the drone in extreme conditions.

Methods

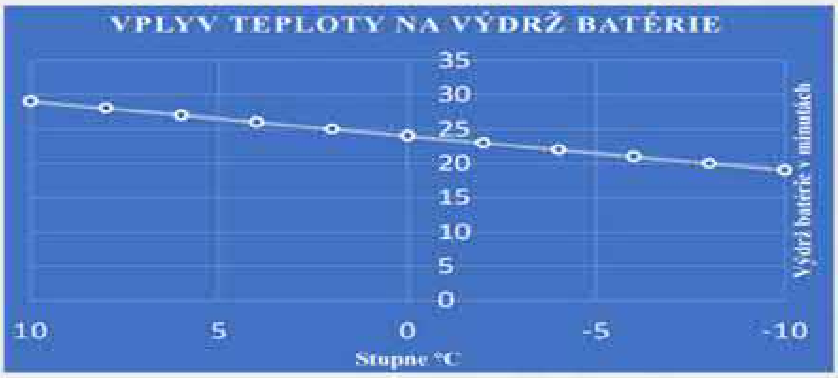
- The main research methods were:
  - experiments,
  - observation,
  - data collection and analysis,
  - suggestions for practice,
  - professional discussion.

Equipment for experiments

- DJI MAVIC 2 PRO drone,
- GPS,
- Drone camera,
- Altimeter radio,
- Camera for documenting the experiment,
- Military smoke bomb,
- Flammable liquids.

Partial result No. 1

- Decrease in battery capacity as the temperature drops



No. 2: Influence of frost on flight characteristics

- Formation of icing on the leading edge of the propeller during flight

No. 3: The functionality of radio altimeter over the water area

- The radio altimeter on the drone reflected the signal from the bottom of the pool and the drone did not maintain the set height above the water surface.

[1] [2] [3]

No. 4: Influence of smoke on the functionality of the drone

- The drone flew around the flames and through the smoke - the drone loses the stability due to the heat release.

[1] [2] [3]

Discussion and recommendations

- The drone operator must monitor the surroundings to avoid a collision with another object - the helicopter. The consequences would be fatal!
- The possibilities of using a drone are limited in extreme conditions!
- During the reconnaissance flight, we must avoid a heavily smoky area!

[4] [5] [6]

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Case Study of Drone Applications Supporting Preventive Flood Management in the Rakaca Water Reservoir
Nemes Dávid
Case Study of Drone Applications Supporting Preventive Flood Management in the Rakaca Water Reservoir
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Case Study of Drone Applications Supporting Preventive Flood Management in the Rakaca Water Reservoir
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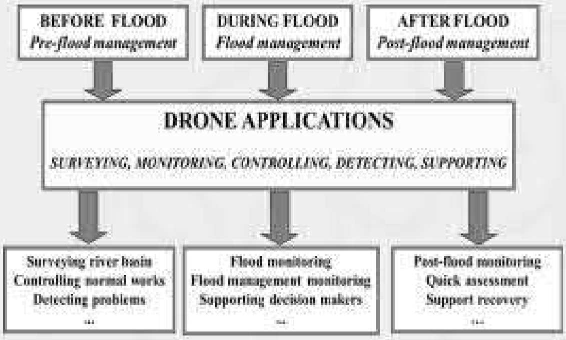
Contents of the presentation

- Abstract
- Introduction
- Methods
- Technology in preventive flood management
- Solved problems with lake Rakaca
- Results of flying
    - Advantages
    - Subserviense in prevention
- Conclusion
- References

Abstract

- **Using drone is efficient**
    - Saving time
    - Cost efficient solution



- **Information flow**
    - Decision making
        - Time saving
    - Reducing loss

[3][4]

Introduction

- **Flood is the most common natural disaster**
  - More and more frequent
  - Delayed

Rivers in Hungary
- Duna and Tisza
- Sajó
- Hernád

Consequences
- Epidemic
- Quality loss of soil
- Loss of lives and properties

Facts
- Flood prevention systems
- 4000 kilometers dams

Retrospection
- -1970 – Tisza
- -2002 – Duna
- -2006 – Tisza and Duna
- -2013 – Duna
- -2020 - Hernád

[1][2][7][8]

Methods

- **Making my own case study**
- **Flying above lake Rakaca**
  - Organizing the flying in advance
  - It took 20 minutes
- **I made and used**

  pictures and videos

  application
- **Set up my own plans**
  - assessment of further work

Technology in preventive flood management

- **Flood modelling**
  - Organizing in advance
  - Preparation
- **Reducing the loss**
  - Sandbags
  - Relocation
- **During flood**
  - Keep in contact
  - Real information

[5]

Solved problems with lake Rakaca

Problems solved by creating the reservoir:

- Ensuring the small water flow of Bódva river
- Storage of the surplus water of Rakaca brook
- Reduction of flood level
- Drinking water base

Developed flood control stucture:
Dam
Intercatchment floodway
Sudge dam
Water level regulator

Industrial use:
Ensuring water requirements of
Kazincbarcika, Sajószentpéter

[10]

Results-intercatchment floodway

- 1.Perception of the crack
  2.Faults in the concrete structure
  3.Plants preventing natural water flow

Conlusion

Actuality

- ✓ Unique flood vulnerability
- ✓ Developing drone technology
- ✓ Protracted harmful events

Using drone:

- ✓ Time saving
- ✓ Cost effective
- ✓ Reliable
- ✓ Information flow is secured
- ✓ Live video
- ✓ Fast decision making process

[6] [9]

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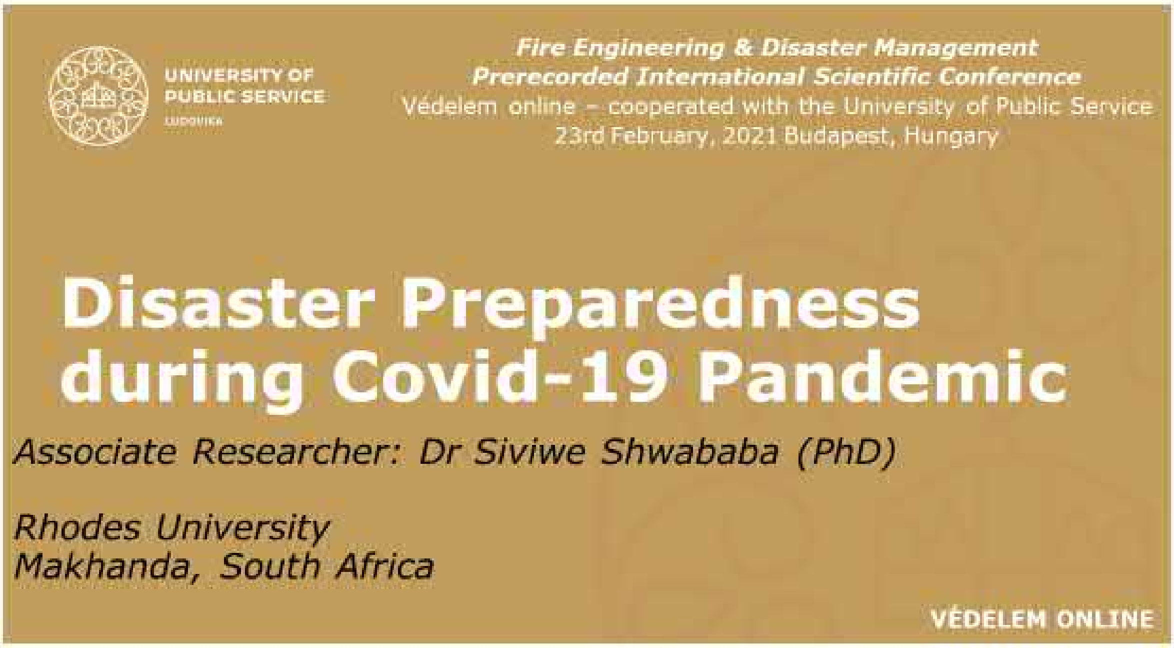
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Disaster Preparedness during Covid-19 Pandemic
Associate Researcher: Dr Siviwe Shwababa (PhD)
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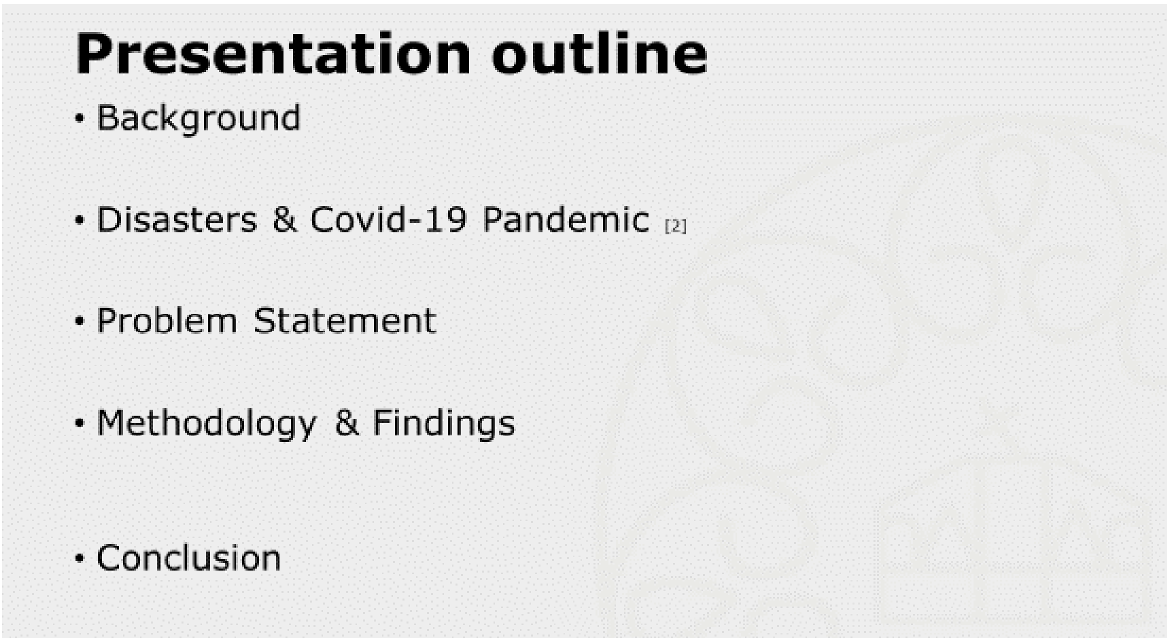

Presentation outline
• Background
• Disasters & Covid-19 Pandemic [2]
• Problem Statement
• Methodology & Findings
• Conclusion

BACKGROUND

Wildfires,floods, storms, droughts, cyclones, storms, extreme temperatures attack communities globally each year. The consequential damages of these climate related disasters have amounted to US$130 billion in 2020. [3][5]

DISASTERS & COVID19 PANDEMIC

- Against the frequency and intensity of these climate related disasters the global community now faces the **double challenge** of mitigating the spread and impact of the COVID-19 pandemic. While also considering the compounding effects of climate-related disasters [5][6][7].
- The COVID -19 pandemic has caused **2,424,060** deaths and over **2.4 trillion $** have been spent on COVID 19 relief efforts[4]
- As Covid- 19 continues to manifest its self through escalating number of infection and deaths. The global community continue to encounter prolonged droughts, wild fires, floods , land slides , cyclone, storms and extreme temperatures [2].

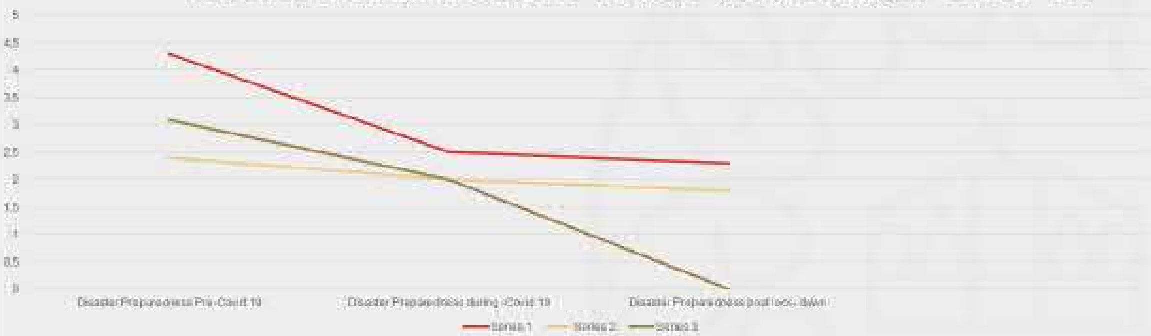
Problem Statement

- Is the global community prepared to cope with climate induced disasters facing them today in the midst of the COVID 19 Pandemic?
- Is it possible to build resilience against the climate induced disasters whilst dealing with the impacts of the Covid-19 Pandemic?

Methodology& Findings

A Comparative case study design was employed to assess global trends on disaster preparedness pre Covid -19 pandemic & during Covid -19 pandemic [1]. Study revealed that disaster preparedness trends were on a upward trajectory pre Covid -19 pandemic , during Covid -19 pandemic disaster preparedness trends showed a downward trajectory. Disaster preparedness is proving to be stressful during the Covid -19 Pandemic .

Disaster Preparedness trends pre,during& Covid- 19



- Disaster Preparedness in covid-19 pandemic period is at an all time low.
- Strengthen public awareness with pro-active and pre-emptive disaster risk reduction options. Disasters can be reduced if people are well informed about the measures to take in reducing their vulnerability.
- Integration of disaster risk reduction plans with development plans at all spheres of government.

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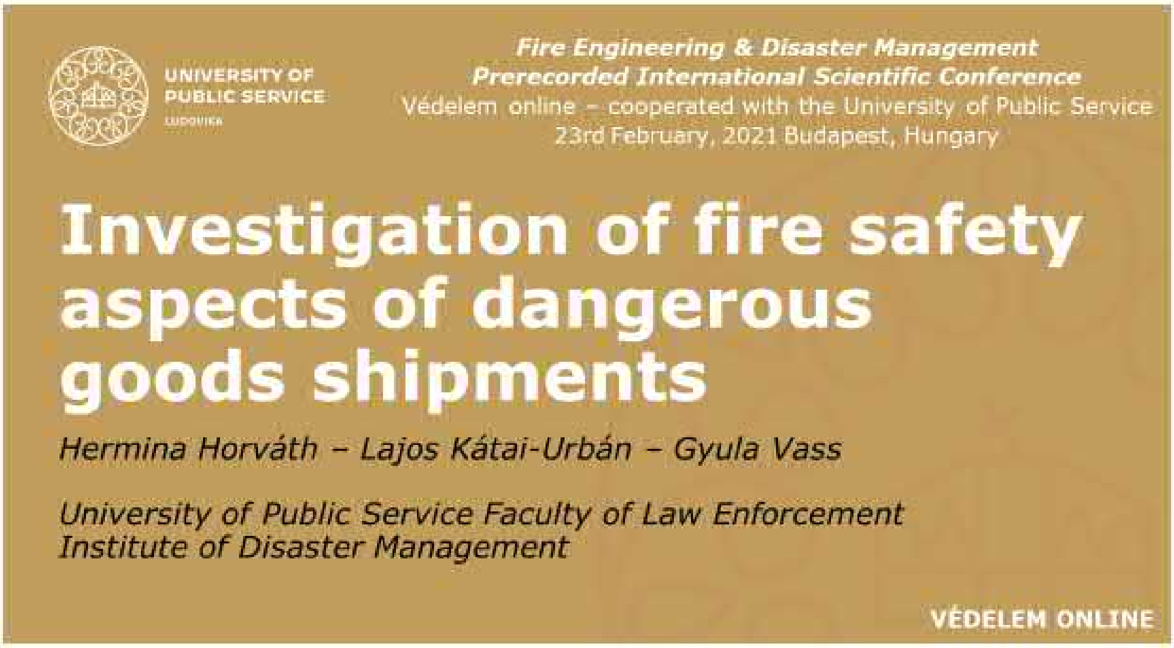
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Investigation of fire safety aspects of dangerous goods shipments
Hermina Horváth – Lajos Kátai-Urbán – Gyula Vass
University of Public Service Faculty of Law Enforcement
Institute of Disaster Management
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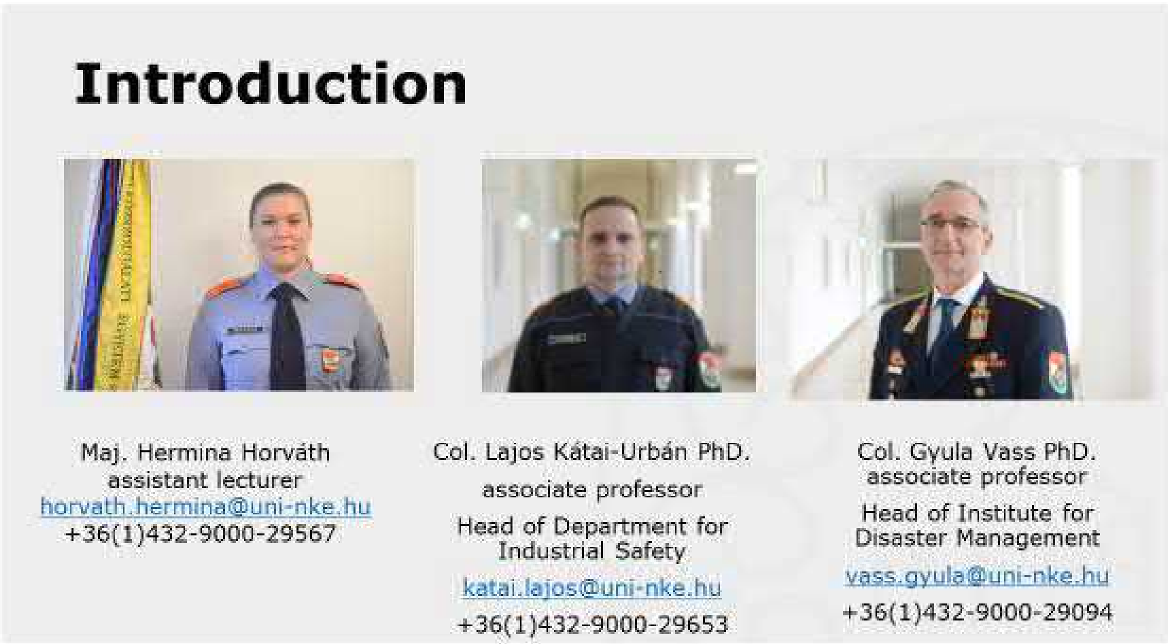
Introduction
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Contents of the presentation

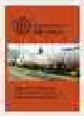
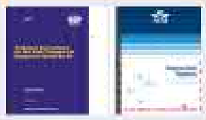
Abstract

- Roles of the economic operators and the authorities in dangerous goods transport;
- Analyzing the groups of flammable dangerous goods highlighteing the basic classification rules related to the transport of dangerous goods;
- Analyzing international and domestic statistical data of flammable dangerous goods;
- Proportions of transport of flammable substances and the analysis of official control figures.

Introduction

- Past and recent foreign and domestic accidents;
- Regulations of dangerous goods transport;
- Presents flammable dangerous goods of transported different groups;
- Statistics of EUROSTAT and Hungarian Central Statistical Office (KSH);

International and domestic legal regulations for the transport of dangerous goods

Road	Internal watervays	Rail	Air
			
UNECE/ADR	UNECE/ADN IMO/SOLAS/IMDG	OTIF/RID COTIF/SZMEGSZ	ICAO/TI IATA/DGR
Act I of 1988 on Road Transport	2005 CLXXXIII. Act on Railway Transport	XLII of 2000 Water Transport Act	1995. XCVII. Act on Aviation

1/2002. (I. 11.) Government Decree INSPECTION

156/2009. (VII.29.) Government Decree FINE

312/2011. (XII. 23.) Government Decree INSPECTION and FINE

313/2014. (XII. 12.) Government Decree CONTROL AND FINES

25/2014 on the safety of transport of dangerous goods. (IV. 30.) NFM decree

BM OKF internal controller, 9/2018. s. Action by the Directors-General on the order of official procedure

Transport of dangerous goods by road

- 34 million freight kilometers / year performance
- Trans - European transport network
- Dangerous goods logistics warehouses (14 pcs)

Accidents

- Pakistan 2017.

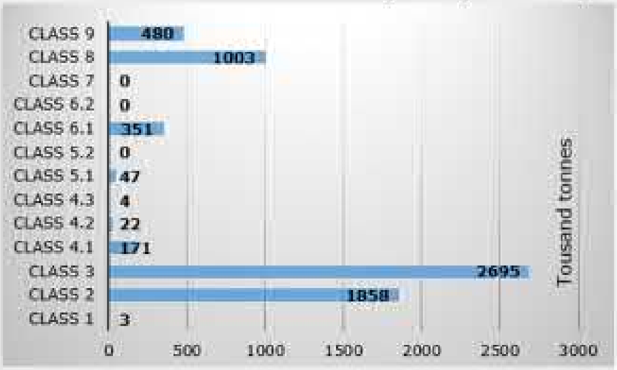
25000 litres of fuel

Bologna, 2018.

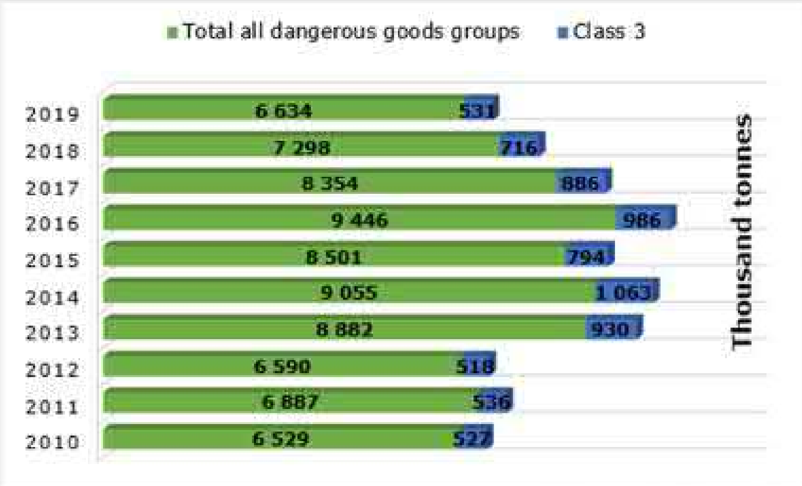
Potential hazard sources – transportation of hazardous materials

Analyzing the statistics

- Analyzing of the proportion of flammable shipments with an international perspective;



Analyzing the statistics



Analyzing the statistics

Result and Conclusion

- Presented some accidenst in the past;
- Analyzed the available statistical data;
- More than half of the transported dangerous goods are flammable materials;
- The proportion of consignments of dangerous goods in Hungary is not outstanding among the 27 EU member states however, by joining the ADR Convention, we undertook to comply with the rules during transport activities.

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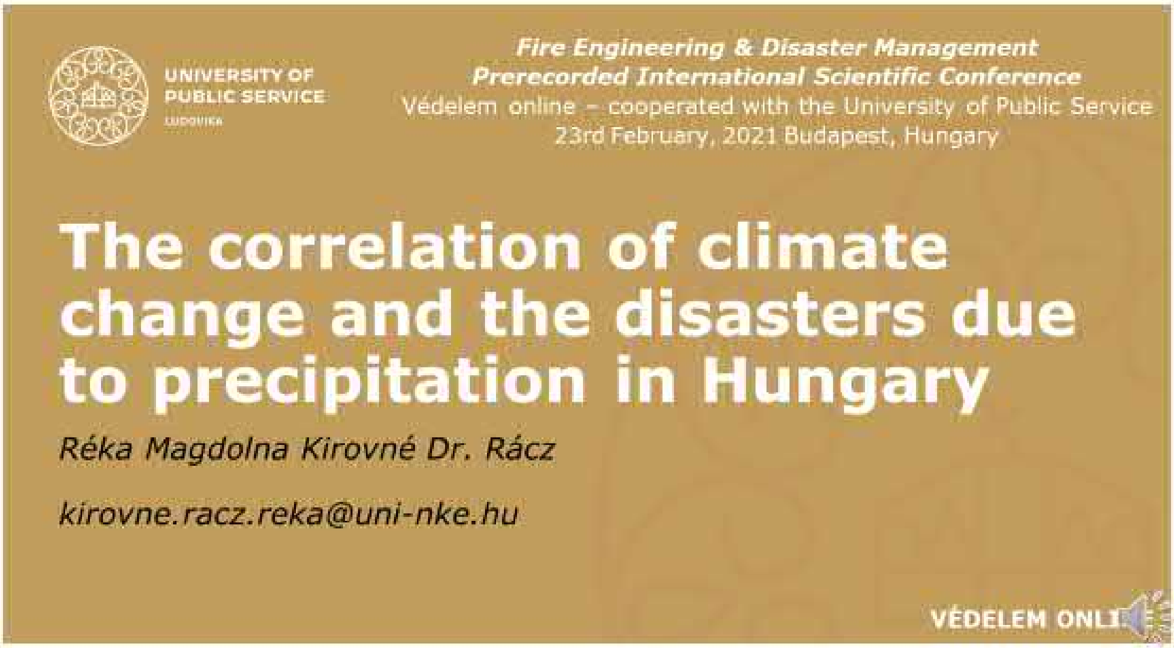
[1] ADR 2019 European Agreement concerning the International Carriage of Dangerous Goods by Road, Budapest, HVESZ 2019.

[2] DIRECTIVE 2008/68/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 September 2008 on the inland transport of dangerous goods https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0068&from=EN (Downloaded: 10.02.2021.)

[3] Annual road freight transport of dangerous goods, by type of dangerous goods and broken down by activity https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do (Downloaded: 10.02.2021.)


UNIVERSITY OF PUBLIC SERVICE
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
The correlation of climate change and the disasters due to precipitation in Hungary
Réka Magdolna Kirovné Dr. Rácz
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Introduction of the author
Réka Magdolna Kirovné Dr. Rácz major
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Reserach area: extreme weather events, climate change, disaster management tasks of the local governments

Contents of the presentation

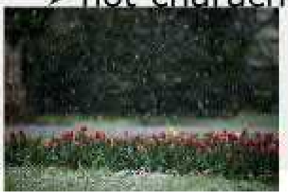
- Abstract
- Introduction of the presentation
- Conclusion, advices
- References

Abstract

- Correlation of extreme weather events and climate change in Hungary
- Hydrologial disasters correlation of extreme rainfall in 2018
- The correlation of disaster management and extreme weather events in the past years
- The response of hungarian disaster management system for these challenges

Extreme weather events and climate change in Hungary

- unusual and extreme natural phenomena and weather anomalies
- the nature wishes to signal to us with drastic with natural disasters
- more frequent, intensive and bear ever more striking features
- not charachteristic for the season



Extreme rainfall

Szolnok, 2019.

Hydrological disasters correlation of extreme rainfall in 2018

- Floods
- Inland water
- Flash floods
- Extraordinary events

The Danube (Budapest) in summer 2018


Disaster management and extreme weather events of the past years
2019
2018
2013
2017
Today's disaster management organizations have to face serious challenges with special regard to the security and disaster management questions posed by climate change.


The main pillars of our disaster management system
fire service
civil protection
industrial safety

The response of hungarian disaster management system for these challenges

- National Disaster Risk Interpretation includes the impacts of climate change
- Terminally emergency prognosis – every County Disaster Management Directorate

Advices

- Extensive, high- standard and complex training and education
- Well- trained professionals
- Sheds light on the causal link between natural disasters and climate changes
- Moral reasons and for possible innovations.

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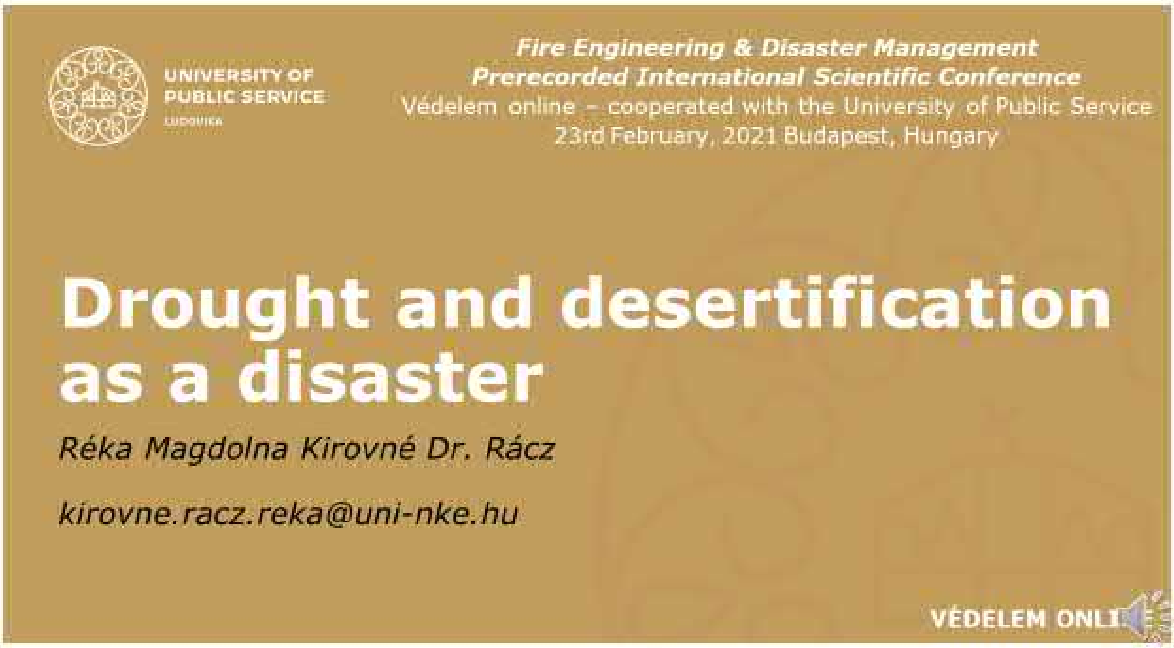
UNIVERSITY OF PUBLIC SERVICE
LUDOVIKA
Fire Engineering & Disaster Management
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23rd February, 2021 Budapest, Hungary
Drought and desertification as a disaster
Réka Magdolna Kirovné Dr. Rácz
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VÉDELEM ONLI


Introduction of the author
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Reserach area: extreme weather events, climate change, disaster management tasks of the local governments

Contents of the presentation

- Abstract
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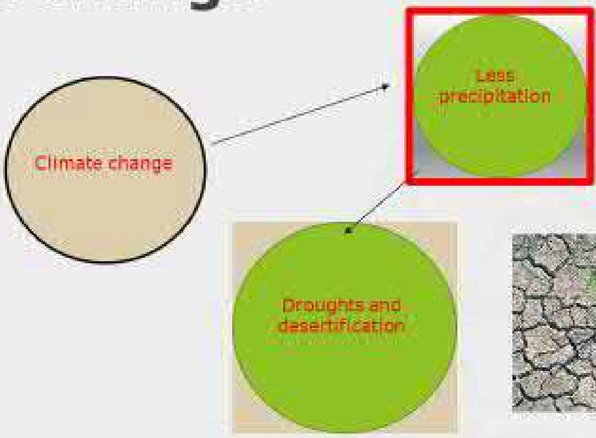
Abstract

- Correlation of droughts and the climate change as a global challenge
- Drought as a disaster (its definiton, types, reasons, characteristics, dangers)
- The adverse effects of droughts

Correlation of droughts and climate change



Global challange

- The global challenge also threatens Europe
- water security
- 2019 Budapest Water Summit
- adaption to the effects of climate change

Drought as a disaster

- less of a "spectacular" disaster than damage caused by excess water
- slow-moving
- they can cause significant damage and affect the functioning of society in many areas
- the effects of drought negatively affect all living organisms, from flora, fauna to humans

Disaster categorization

- Natural Disasters

- Meteorological
- Hydrological
- Geological
- Biological

Drought and desertification

Drought differs from other natural disasters

- Slow.
- Beginning - spatial extent.
- Its effects do not cease immediately.
- Its impact occurs in all areas of life.

Definition, types and reasons of drought

- 2007 EU Drought Strategy Paper
- Types of drought
- 2012 Drought Strategy plan (Hungary)
- Reasons of drought

Groundwater resources

- Climate change is also affecting groundwater resources.
- Warming can reduce the infiltration
- National Water Strategy

The adverse effects of drought

- Agriculture – food
- Forestry – forest ecosystem – wild fires - ecological and economic damage
- Livestock - water shortages put a strain on the animals

Conclusion, advices

- It is essential to inform the citizens and to raise the necessary public.

- In my opinion, it is extremely important to include the dissemination of knowledge on climate change, including the problem of drought, in the training of disaster management (and other professionals in the defense sector), as this will give them the knowledge that highlights the causal links between natural disasters and climate change and the effectiveness of preparedness and response.

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Alice Ncube - Joyce Jamila Ndovella: *Resilience mechanisms displayed by informal settlement dwellers towards shack fires in South Africa*

OUTLINE

- Introduction and background
- Informal settlements in South Africa and EThekwini
- Description of the study area
- The conceptual and theoretical framework
- Community resilience and adaptation
- Research design and methodology
- Results and Discussion
- Conclusions and recommendations

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PHOTOS ILLUSTRATING THE DENSE RESIDENTIAL SETUP AT PALMIET INFORMAL SETTLEMENT.
SOURCE: ETHEKWINI MUNICIPALITY, DISASTER MANAGEMENT CENTRE 2018

INTRODUCTION AND BACKGROUND

Informal settlements, although fragile, display evolutionary resilience and adaptability to changes in the urban context.

However, government structures at times do not recognise this inherently resilience displayed by informal settlements – lack of direct engagement.

Geographical, political, social, and environmental factors, stakeholder interactions, prioritisations, and decision making create barriers for government to implement disaster risk management policies and strategies

issues come up as

-upgrading of informal settlements

Interactions of both socio-economic structures at community level and government agencies is vital to develop community capacities

Political dynamics in the community is crucial > political marginalization

Underrated is the collective actions taken by communities

The study is in accordance with the perspective advanced by different authors to investigate factors that enhance community fire resilience and adaptation, with a strong focus on internal coping capabilities. It further seeks to explain how these factors address the immediate needs of this community and significantly contribute to building resilience and adaptation at the levels of the individual, household, community and municipality

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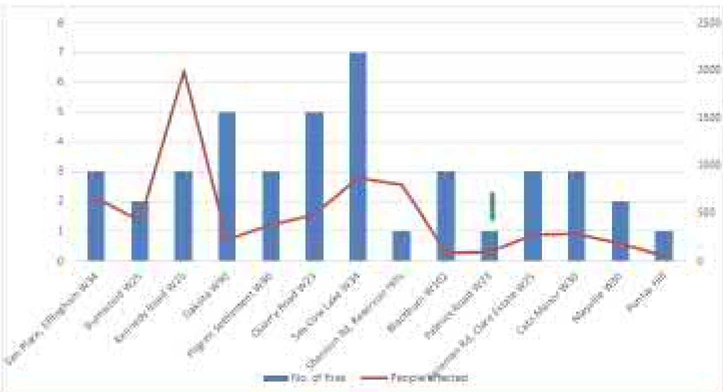
INFORMAL SETTLEMENTS IN SOUTH AFRICA AND ETHEKWINI

- In South Africa about 40% households live in informal houses, of which 7.8% are in the KwaZulu-Natal province (Brown-Luthango *et al.*, 2016)
- Due to the recurrent shack fires the EThekwini municipality conducted a **trend analysis** was conducted between 2010 and 2017

FIRE TREND ANALYSIS OF ETHEKWINI MUNICIPALITY BETWEEN 2010 &2017
SOURCE: ETHEKWINI DISASTER MANAGEMENT STATISTICS 2014-2016



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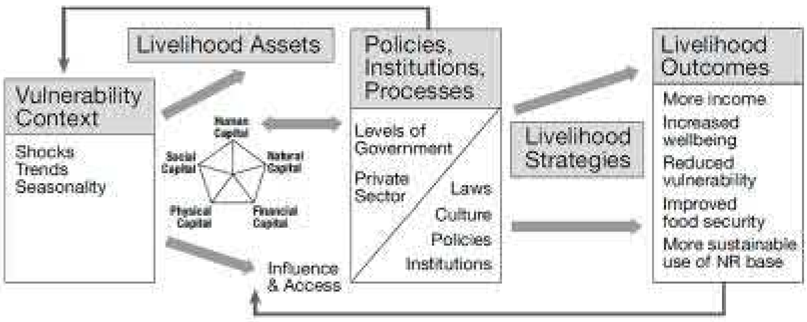
DESCRIPTION OF STUDY AREA

CONCEPTUAL AND THEORETICAL FRAMEWORK



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RESEARCH DESIGN AND METHODOLOGY

- Case study approach
- predominantly qualitative and lesser quantitative .
- A semi-structured questionnaire was designed, piloted and used to interview the participants.
- Observations and informal conversations were also used as part of the triangulation method to get more meaning to the study

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RESEARCH DESIGN AND METHODOLOGY

- The population of Palmiet, L-Section was used in the study. L-Section has a population of approximately 2 000, with 327 households.
- A non-probability sampling technique using subjective judgement of the researcher, assisted by the councillor.
- The criteria for selection was the location, knowledge and experience of participants. These individuals were considered knowledgeable in matters to do with the settlement living conditions
- A sample size of 65 households
- All the participants were briefed on the objectives of the study. Ethical considerations were observed during the data collection process.

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RESULTS AND DISCUSSION

Community demographics

Demographic	Category	Number of respondents (n=65)	Percentage
Age (years)	18-24	9	13.9
	25-34	20	30.8
	35-44	22	33.9
	45-54	11	16.9
	55-64	3	4.6
	65 or older	–	–
Gender	Male	37	56.92
	Female	28	43.08
Language spoken	Zulu	48	73.85
	Xhosa	13	20
	Sotho	1	1.54
	English	1	1.54
	other	2	3.08
Education level	Primary	14	21.54
	Secondary	44	67.69
	Tertiary	2	3.08
	No Education	5	7.69
Marital status	Single never married	33	50.77
	Cohabiting	12	18.46
	Domestic partner	10	15.38
	Married	5	7
	Separated	2	3.08
	Widowed	2	3.08
	Divorced	1	1.54

Source: Survey results, 2018

RESULTS

Community fire risks knowledge

	Category	Number of respondents	Percentage
Fire incidences experienced	Yes	50	77
	No	15	23
Causes of fire incidents	Illegal electricity connections	26	40
	Candles	23	35.38
	Arson	15	23
	domestic fights and negligence	13	20
	sleeping while cooking, the use of paraffin stoves, and ignorance	5	7.69
Lighting and cooking equipment used	Electricity for lighting	64	98.46
	Electricity for cooking	63	96.92
	Paraffin for lighting	1	1.54
	Paraffin stove for cooking	1	1.54
Knowledge on potential fire hazards	Yes	36	55
	No	29	45
Knowledge regarding fire safety	No basic Fire training	60	92.31
	Fire awareness training	5	7.69
	Aware of the safety measures to be taken during a fire	45	69.23
	No knowledge of safety measures during a fire	20	30.77
Fire equipment on site	No fire equipment in the house	59	90.77
	Fire blankets	2	3.08
	Fire extinguishers	2	3.08
	Sand buckets	2	3.08
Knowledge of fire hydrants	YES (have knowledge and exact place where the hydrants are located)	17	26
	No (Have no knowledge and they do not even know what a fire hydrant is)	48	74

Source: Survey results 2018

OPINIONS ON THE IMPACTS OF FIRES

- life becomes very difficult
- the poor get poorer
- loss of lives
- loss of income
- injuries and death
- lose everything
- damage to food
- damage to property and belongings
- leads to fights
- destroys children's school uniforms and books
- displacement of families
- suffer from trauma and depression

REPORTING OF FIRE INCIDENTS

: Reporting of fire incidents

Responses	No. of Responders
As soon as possible	18
Report fire immediately and then try to extinguish the fire	10
Extinguish the fire and then call when overpowered by fire	4
Extinguish fire because I don't know the fire department number	1
Extinguish the fire and even demolish dwellings that are on fire in order to stop the spread of the fire	1
Call for community help and put out fire, report fire later	23
Remove staff than put out fire	1

Source: Survey results 2018.

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COMMUNITY FIRE RESILIENCE AND INDICATORS

- Cooperation with local fire station
- *Effective fire response*
- *Management of fires between local authority & the community*
- *Rolling out of fire awareness programmes*
- *Involvement of community in fire safety*
- *Communication during fire incidents*
- *Early fire warnings*

Economic activities and financial resources

	Category	Number of respondents (n=65)	Percentage
Employment status	Temporary employment	34	52.31
	Unemployed	18	27.69
	Permanent employment	8	12.31
	Fixed term contracts	5	7.69
Main source of income	Wages	22	33.85
	Salary	17	26.15
	Stipend	13	20
	Income from piece jobs	6	9.23
	Government grants	7	10.77
Monthly household income	>R1150	28	43.08
	R1100-R900	6	9.23
	R600- R850	12	18.46
	R300- R550	18	27.69
	< R300	1	1.54
	Government support	33	50.77
Financial support after a fire incident	Monthly income	23	35.38
	Family and friends	9	13.85

Source: Survey results 2018

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Social and community engagement

	Category	Number of respondents	Percentage
Engagement with the councillor	Know who their councillor	43	66.15
	Did not know	22	33.85
	Attend meetings with councillor	29	44.62
	Do not attend	36	55.38
Community structures & social networks	Do not know of any structures	33	50.77
	Have seen community care givers	16	24.62
	Abahlali baseMjondolo (present in the community	10	15.38
	Community field workers	6	9.23
Belonging to any social group	Yes	30	46
	No	35	54
Engagement on fire issues with the Field workers	Yes	11	17
	No	54	83
Voluntary work in the community	Yes	16	25
	No	49	75

Source: Survey results, 2018

Opinions on fire prevention and reduction measures

No.	Opinions on fire prevention and reduction measures	Number of Participants
1.	Municipality to conduct fire awareness	17
	Installation of electricity and removing of illegal electrical connections	33
	Municipality to build proper houses	29
	Open fire station closer to settlement	3
	Provide an emergency toll free number	1
6.	Installation of fire hydrant at settlement	2
7.	Municipality to provide them with fire extinguishers	8
8.	Issuing of early fire danger warnings	1
9.	Fire department to provide effective fire response by responding quicker to fires	4
10.	Sufficient relief aid must be provided	1
11.	Provide additional water standpipes	2
12.	Open access routes for fighting	4
13.	Provide basic fire training	6
14.	Request for a skip for waste control purposes	1
15.	Request that the fire department listens to their advice when coming to extinguish a fire as they know the settlement area better	1
16.	They want nothing because the municipality failed them a long time	1

Source: Survey results 2018

PALMIET INFORMAL SETTLEMENT

- *Have built a community hall to accommodate those affected*
- *They are not opening up spaces for fire engines because people will erect shacks in those spaces*
- *They talk to members who pause threats to them by reckless behavior*
- *They have developed capacities for handling any fire – report only if it is too much to handle*
- *They do not trust the govt officials to promptly assist them*

- *CBDM adopted by this community have resulted in enhanced resilience and better adaptation to informal settlement fires.*

CONCLUSION

- The risks are further increased by the dense setup, which limits access for firefighting while increasing the spread of fires. There is also a challenge in terms of access to water for firefighting. Palmiet informal settlement is not different from all other settlements. However, noticeably less fire incident are reported due to their human, social and economic capitals. It was also interesting to find out that the community built a hall to house those who could be displaced by fire or any other hazard. There are strong social networks in the community too. An example of the social network is *Abahlali Basemjondolo*, which has over the years challenged to government to pay attention to their plight countrywide. They may not have natural capital, however they are utilising the other assets to their best abilities in order to reduce the shack fire risks. They have adapted well and are more resilient than others in the informal settlements are.

RECOMMENDATION

- The officials need to tap into the community knowledge , though informal, this can lead to reduction community vulnerabilities.
- officials need to buy into the community goal to prevent and reduce fire incidents in order to ensure the safety of the community.
- There is a great need for the integration of scientific knowledge with that of the local community, in order to develop effective and risk-free fire management strategies.

It is evident that the community possesses vast knowledge of the settlement conditions and operations, which may be very useful to consider during the fire management-planning phase.


Fire Engineering & Disaster Management 2021
On-line Conference – University of Public Service
Analysis and Evaluation of the Relation between Agriculture and Disaster Management
Dr. László Teknős ff captain, assistant professor
Institute of Disaster Management of the Faculty of Law Enforcement of the University of Public Service
The publication is supported by the EFOP-3.6.3-VEKOP-16-2017-00008 project. The project is co-financed by the European Union and the European Social Fund.
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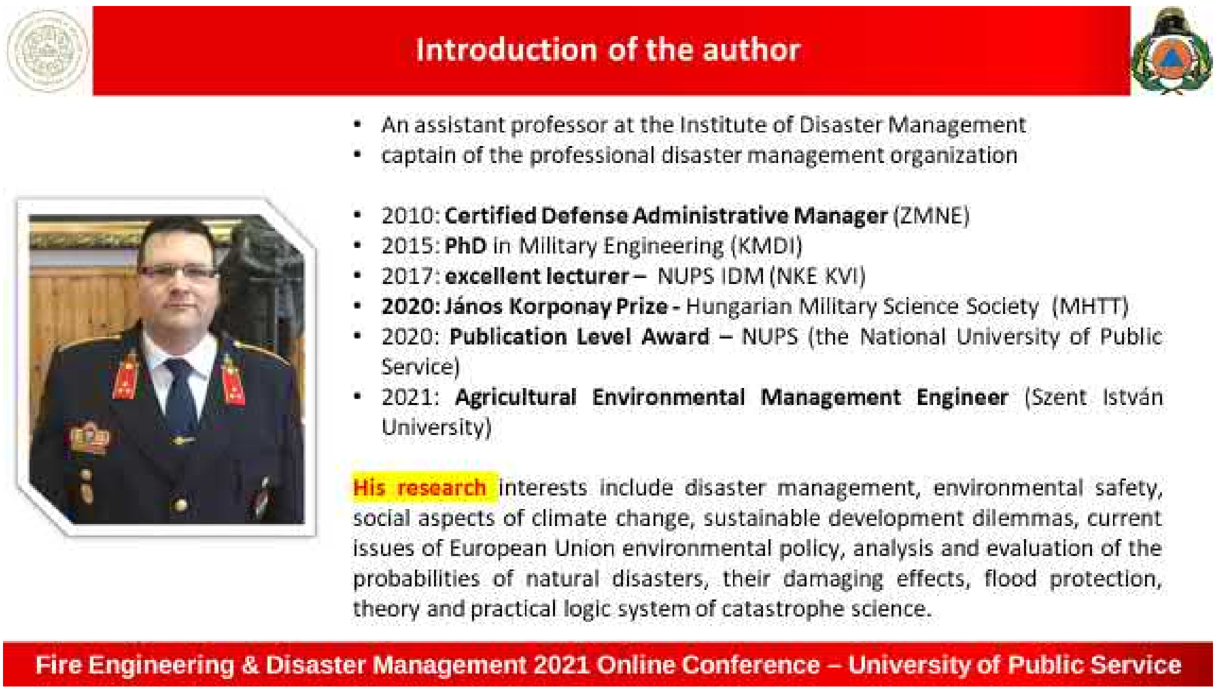
Introduction of the author
• An assistant professor at the Institute of Disaster Management
• captain of the professional disaster management organization
• 2010: Certified Defense Administrative Manager (ZMNE)
• 2015: PhD in Military Engineering (KMDI)
• 2017: excellent lecturer – NUPS IDM (NKE KVI)
• 2020: János Korponay Prize - Hungarian Military Science Society (MHTT)
• 2020: Publication Level Award – NUPS (the National University of Public Service)
• 2021: Agricultural Environmental Management Engineer (Szent István University)
His research interests include disaster management, environmental safety, social aspects of climate change, sustainable development dilemmas, current issues of European Union environmental policy, analysis and evaluation of the probabilities of natural disasters, their damaging effects, flood protection, theory and practical logic system of catastrophe science.
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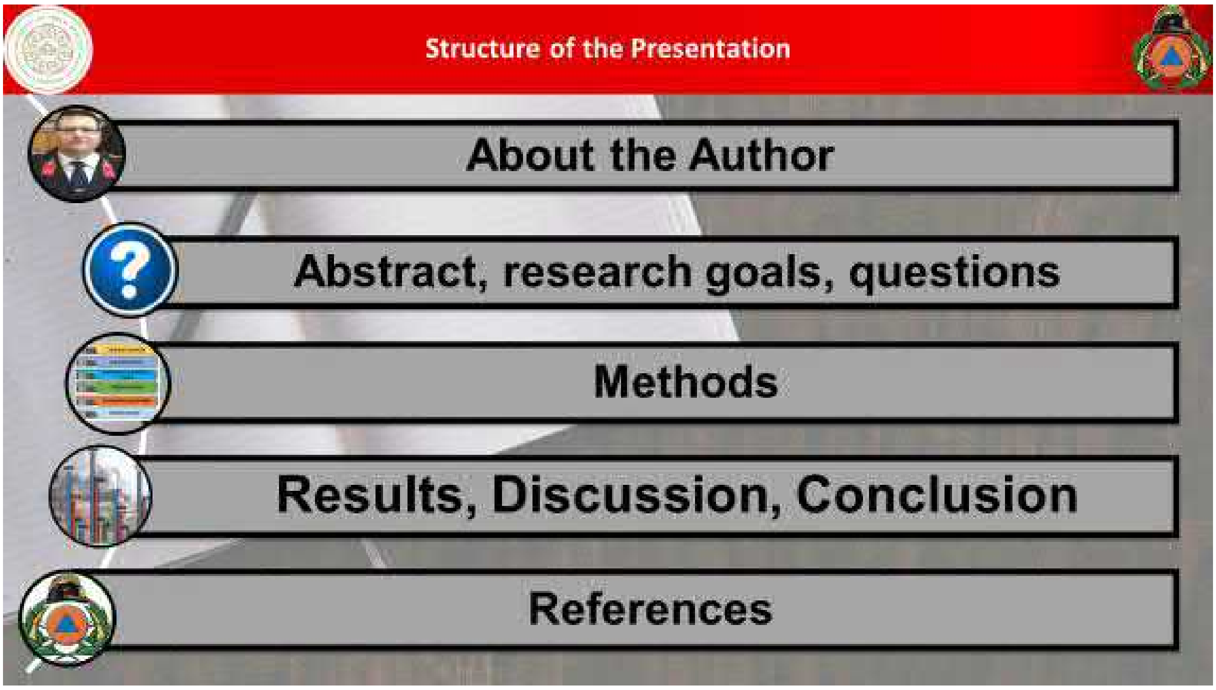
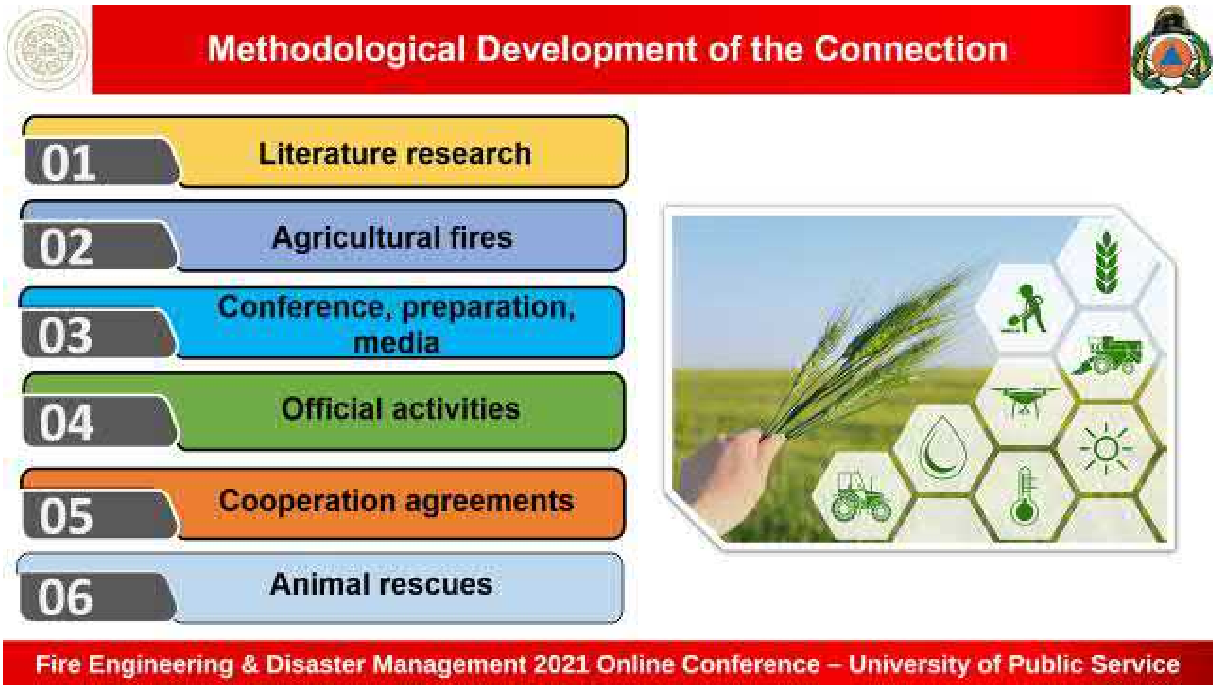
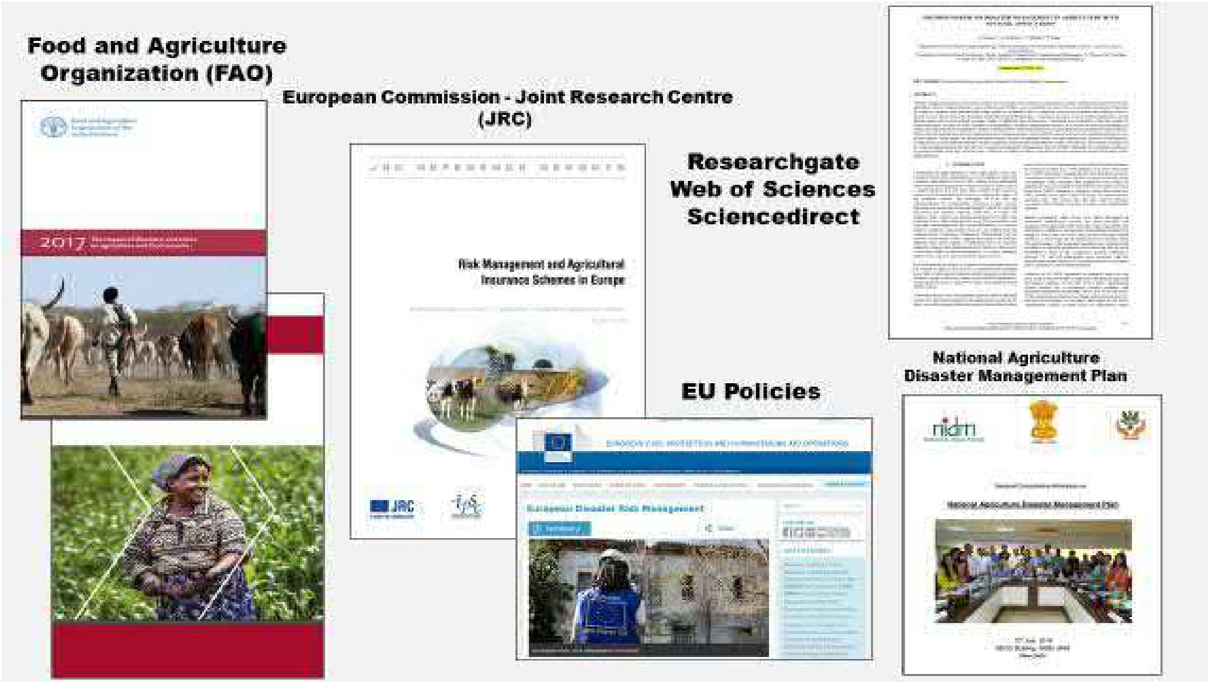

Structure of the Presentation
About the Author
Abstract, research goals, questions
Methods
Results, Discussion, Conclusion
References


Goals – questions
1
IS THERE A CONNECTION BETWEEN AGRICULTURE AND DISASTER MANAGEMENT?
2
IS THE DISASTER MANAGEMENT TASK SYSTEM SUPPORTIVE?


Methodological Development of the Connection
01 Literature research
02 Agricultural fires
03 Conference, preparation, media
04 Official activities
05 Cooperation agreements
06 Animal rescues
Fire Engineering & Disaster Management 2021 Online Conference – University of Public Service

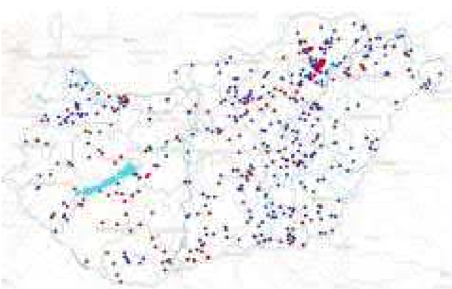

Literature research
Speiser Ferenc (2016): Szárítótűz – Begyulladt a napraforgó!
Nagy Péter (2016): Mezőgazdasági gépek tüzei
Dr. Bérczi László, Daruk Anita (2018): A nyári időszakban bekövetkezett szabadtéri tüzek tapasztalatai
Dr. Bérczi László, Daruk Anita (2019): Nyári mezőgazdasági tüzesetek – mezőgazdasági gépek és terményszárítók tüzei
Dr. Mógor Judit – Szalay Linda (2016): A katasztrófavédelem vízvédelmi hatásköre az EU nitrát irányelv végrehajtása érdekében



A common feature of summer harvesting work is that, in addition to **heavy physical exertion**, they are also **flammable** (for example, harvesting grain).

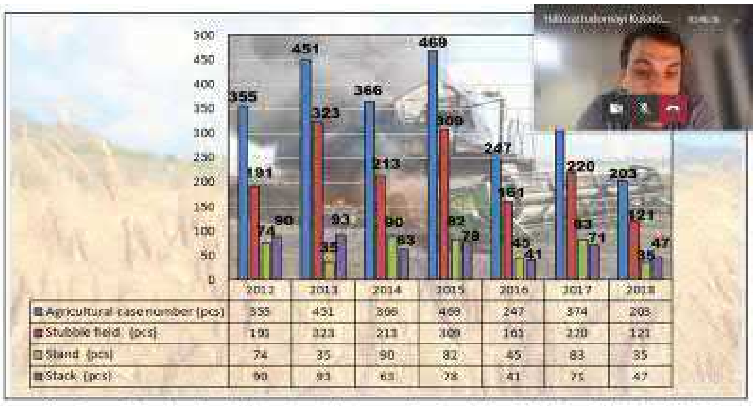
Another fire-hazardous part of harvesting is **baling**.

In addition to stand, the **combine** is also of a great value.



Map Display of Harvest Fires

Harvest fires of 2015 (blue) and 2016 (red)



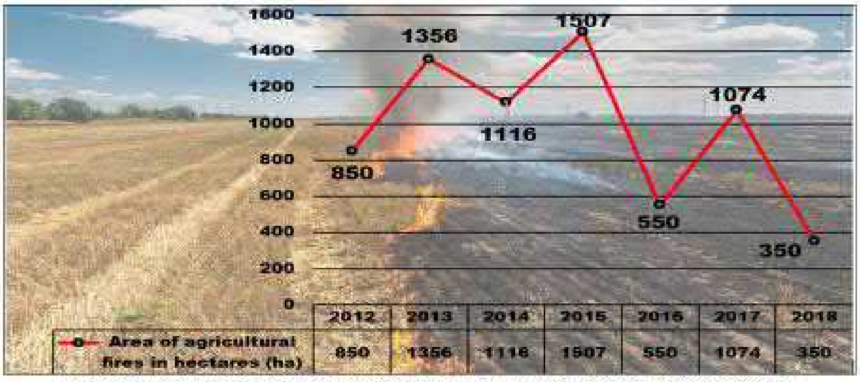
	2012	2013	2014	2015	2016	2017	2018
Agricultural case number (pcs)	355	451	366	469	247	374	203
Stubble field (pcs)	191	323	213	309	161	220	121
Stand (pcs)	74	35	90	82	45	83	35
Stack (pcs)	90	93	63	78	41	71	47

Number of Agricultural Fires (pcs) between the Period of 01/06 – 31/08, 2012-2018

Made by László Teknős 2019, based on the data of the National Directorate General for Disaster Management of the Ministry of Interior)

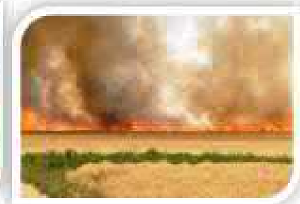
With the decrease in the number of harvest fires, the areas of stand and stubble damaged by the fire also decreased, so the economic damage caused by the fire also decreased significantly. The improving trend can be seen here as well.

An improving trend!



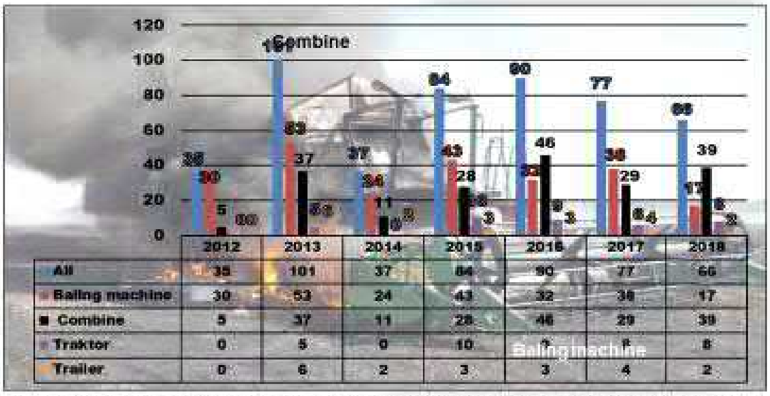
Area of agricultural fires in hectares (ha) between the period of 01/06 – 31/08, 2012-2018

Made by László Teknős 2019, based on the data of the National Directorate General for Disaster Management of the Ministry of Interior)



Baling machines and combines have many wearing and rotating parts. Overheating caused by their failure and wear can easily cause fire.

It is not uncommon for an ignited baler machine to fail to be disconnected from the power plant and to be damaged in a fire together. To extinguish incipient, extensive fires, manual fire extinguishers are generally sufficient and should be kept readily available in the vehicle in an easily accessible place.



Number of Fires of Agricultural Machinery (pcs) between the Period of 01/06 – 31/08, 2012-2018

Made by László Teknős 2019, based on the data of the National Directorate General for Disaster Management of the Ministry of Interior)

In order to reduce the fires of agricultural machinery, Decree 54/2014 (XII. 05.) of the Ministry of Interior on the National Fire Protection Regulations also regulates the participation of machinery in harvesting works.

The main causes of fire include

- technical status,
- mostly electrical failure,
- fire in and around the control panel (tractors over twenty years old),
- negligence of those working in the field (smoking, use of open flame).

Ferenc Érces: A three-day supervisory inspection was help in eight counties. During nearly four hundred inspections, more than 160 irregularities were found.

- Tolna County Organization of National Chamber of Agricultural Economics
- Paks Disaster Management Office

2016: Somogy County Disaster Management Directorate professional meeting related to fire protection

January 2020: participation in AGROmashEXPO

Results, Discussion, Conclusion

- The professional disaster management organization is a non-agricultural organization, yet its tasks arising from its basic purpose include those that contribute to more efficient, safer agricultural activities.
- Fire protection always gives priority to agriculture (harvesting works)
- Priority focus: prevention
- In general, official calls proved to be sufficient to correct the irregularities detected

Connection points:

- Prevention, addressing and elimination of fires and damage related to the harvesting of agricultural crops
- Campaigns and forums for responsible social behaviour
- Preparation, websites
- Powers of water and water protection authorities

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Thank you for your attention!

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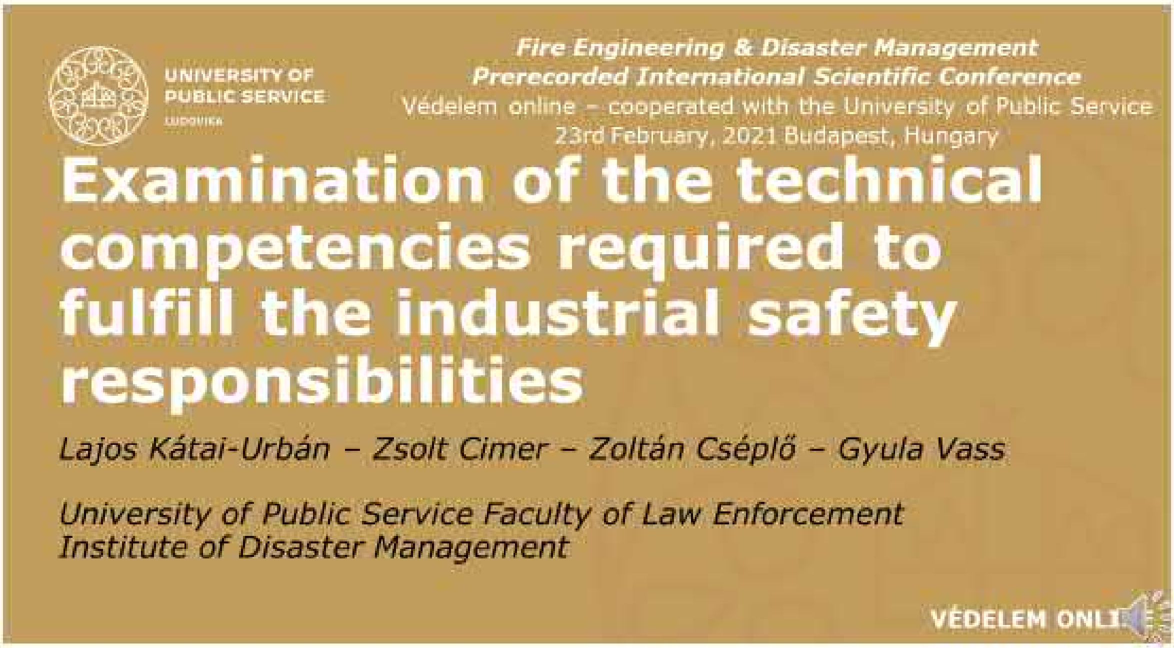
UNIVERSITY OF PUBLIC SERVICE
LUDOVIKA
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Examination of the technical competencies required to fulfill the industrial safety responsibilities
Lajos Kátai-Urbán – Zsolt Cimer – Zoltán Cséplő – Gyula Vass
University of Public Service Faculty of Law Enforcement
Institute of Disaster Management


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Contents of the presentation

- Abstract
- Introduction
- Methods
- Industrial safety competences
- Technical requirements
- Training and education aspects
- Result, conclusion
- Referenses

Abstract

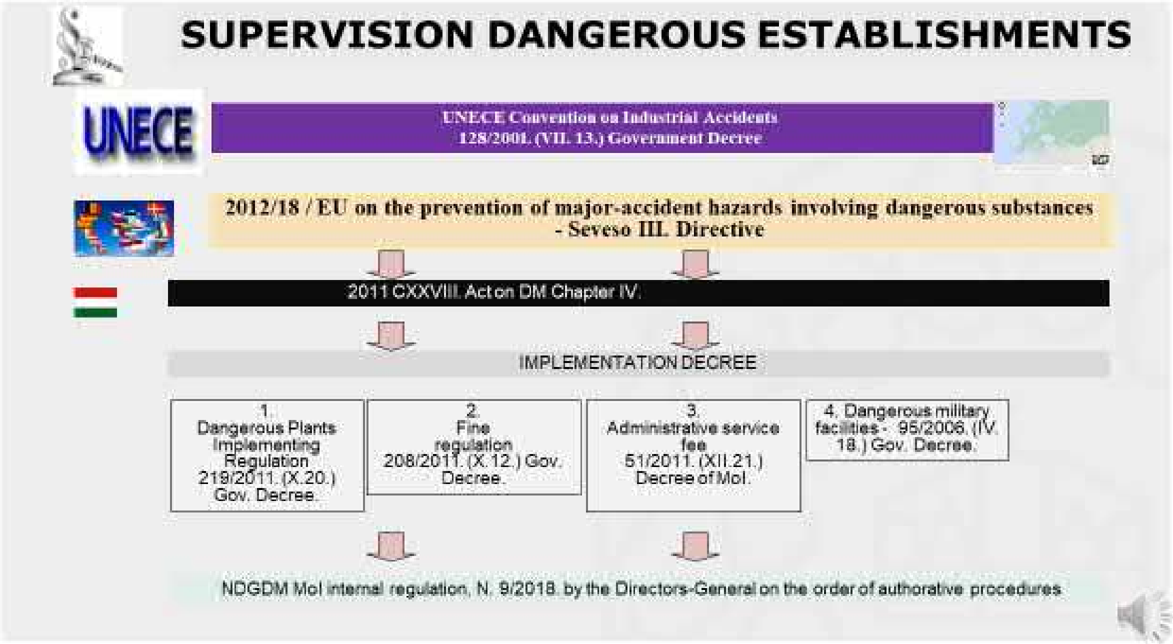
- The development of Hungarian system for industrial safety has more than a 20 years history.
- In addition to the supervision of dangerous establishment and the transport of dangerous goods, disaster management tasks related to critical infrastructure and nuclear emergency response have also emerged.
- In this article, the authors examine the technical competencies associated with industrial safety responsibilities.

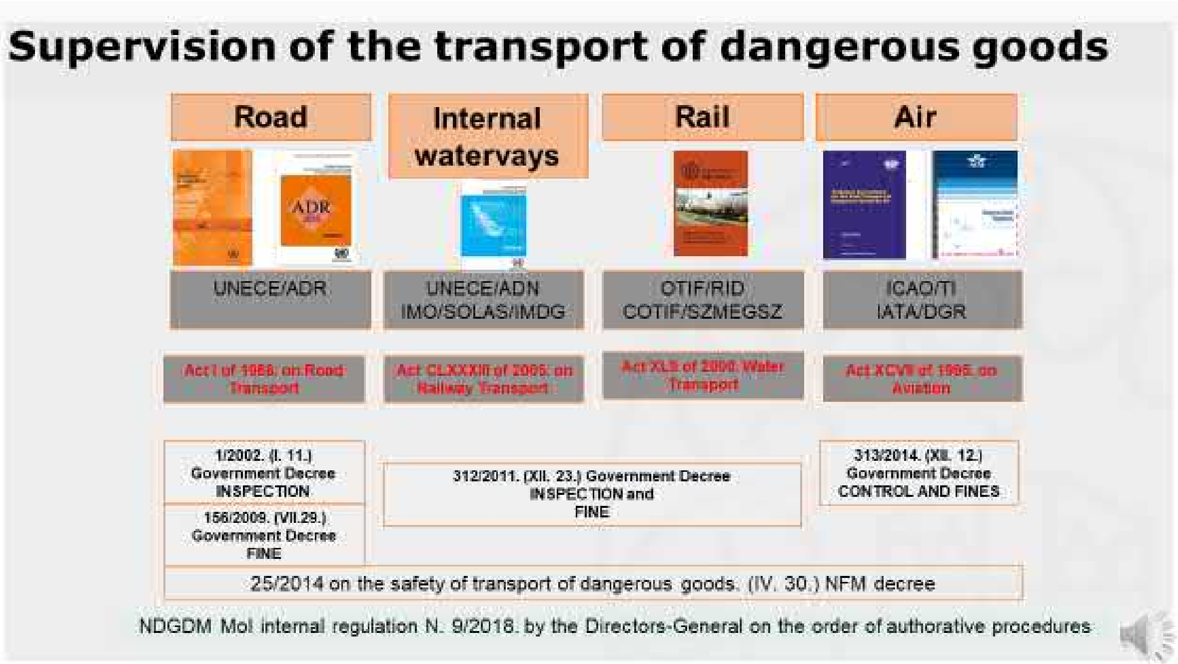
Methods

- Analysis and evaluation of international and domestic legal regulations on industrial safety and related scinetific literature.
- Examination industrial safety's law enforcement experience of operators and industrial safety authorities

Introduction

- Operator responsibilities and associated duties and responsibilities of the industrial safety authority.
- Determining a socially acceptable level of risk.
- Prescribing technical requirements.
- Development of procedures and methodology, and also the tool system.


SUPERVISION DANGEROUS ESTABLISHMENTS
UNECE
UNECE Convention on Industrial Accidents
128/2001. (VII. 13.) Government Decree
2012/18 / EU on the prevention of major-accident hazards involving dangerous substances - Seveso III. Directive
2011 CXXVIII. Act on DM Chapter IV.
IMPLEMENTATION DECREE
1. Dangerous Plants Implementing Regulation 219/2011. (X.20.) Gov. Decree.
2. Fine regulation 208/2011. (X.12.) Gov. Decree.
3. Administrative service fee 51/2011. (XII.21.) Decree of MoI.
4. Dangerous military facilities - 95/2006. (IV. 18.) Gov. Decree.
NDGDM MoI internal regulation, N. 9/2018. by the Directors-General on the order of authorative procedures


Supervision of the transport of dangerous goods
Road
Internal watervays
Rail
Air
UNECE/ADR
UNECE/ADN IMO/SOLAS/IMDG
OTIF/RID COTIF/SZMEGSZ
ICAO/TI IATA/DGR
Act I of 1988. on Road Transport
Act CLXXXIII of 2005. on Railway Transport
Act XLII of 2000. Water Transport
Act XCVII of 1995. on Aviation
1/2002. (I. 11.) Government Decree INSPECTION
156/2009. (VII.29.) Government Decree FINE
312/2011. (XII. 23.) Government Decree INSPECTION and FINE
313/2014. (XII. 12.) Government Decree CONTROL AND FINES
25/2014 on the safety of transport of dangerous goods. (IV. 30.) NFM decree
NDGDM MoI internal regulation N. 9/2018. by the Directors-General on the order of authorative procedures

Critical infrastructure protection

Council Directive 2008/114 / ECon the identification and designation
of European Critical Infrastructure, and assessing the need to improve their protection

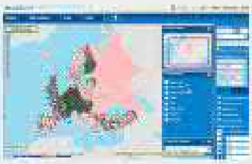
Act CLXVI of 2012
on identification, designation and protection of Critical Systems and Facilities

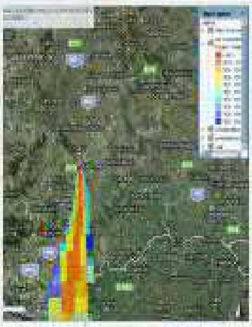
Gov. Decree 65/2013. (III. 8.)
on the implementation of Act CLXVI of 2012
on identification, designation and protection of Critical Systems and Facilities

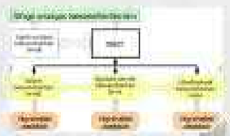
Energy	Water	Agricultur e	Public order and defense	National defence	Transport ation	Health	Finance	Social safety	Info-communi cation technolog ies
374/2020 (VII. 30.) Gov. Decree	541/2013 (XII. 30) Gov. Decree	540/2013 (XII. 30) Gov. Decree	512/2013 (XII. 29) Gov. Decree	369/2015 (XII. 2.) Gov. Decree	161/2019 (VII. 4.) Gov. Decree	248/2015 (IX. 8.) Gov. Decree	330/2015 (XI. 10.) Gov. Decree	-	249/2017 (IX. 5.) Gov. Decree

Disaster Management Tasks in Nuclear Accident Preparedness

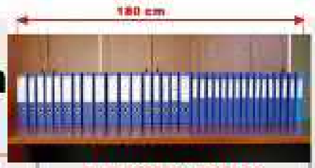
- Participation
  - the National Nuclear Emergency Response System (ONER) and the
  - In the application of National Accident Prevention and Response Plans (OBEIT)
  - OSJER - Operation of the National Radiation Monitoring, Signaling and Control System
  - operation of the EURDEP system for measuring background radiation (European Radiological Data Exchange Platform)
  - Collection of data from measuring stations installed by Paks Nuclear Power Plant
  - Operation of RODOS online decision support system
  - Public information on data from radiological measuring stations







System of documentations for major accident prevention and preparedness



UNDER TIER establishments ¼ of the LTE threshold level	LOWER TIER dangerous establishments	UPPER TIER dangerous establishments
-	Safety analises	Safety report
Major emergency response plan	Internal emergency plan	
Eventualy External emergency plan		External emergency plan
-	Land-us e planning	
HU regulation	Seveso III. Directive	

Activities of the authority

Licensing

Dangerous plant or facility construction permit procedure

Starting a dangerous activity

On-site inspection: Plant identification, verification of the reality content of safety documentation

Supervision

Planned review:
Safety report, safety analyses every 5 years
Internal emergency plan every 3 years
serious incident response plan every 5 years

Unplanned review:

Significant change
After a serious accident or incident

Inspection

Periodic official inspections

Monitoring of internal emergency plans and serious incident response plans practices

Supervisory industrial safety inspection (complex and ad hoc)

Technical requirements and tools for authority decision-making

Qualification area	Qualification criteria and criteria system for technical requirements	Authority instrument used
Hazard classification for dangerous operations	Results of risk - based on quantitative risk analysis. Technical requirements for individual risk of death and social risk in the Implementing Regulation	Risk analysis software (DNV PhastRisk) Internationally accepted procedures and methods and repositories. Dutch colour books. Official procedures.
Designation of a danger zone	Individual injury risk requirements in the Implementing Regulation.	
Resolution on development in the danger zone	Specific building requirements tabulated for each zone	Implementing Regulation. Official procedures.
Internal emergency plan	Calculation of endangered area with consequence analysis. No specific technical requirements are specified. Quality criteria set out in the Implementing Regulation. Are the protection measures proportionate to the hazards identified in the safety documentation, Are the conditions for carrying out the tasks indicated in the planned measures.	Consequence analysis software (DNV PhastRisk) Internationally accepted procedures and methods and repositories. Dutch colour books. Official procedures.
Serious incident response plan	Quantitative requirements based on consequences set out in the Annex to the Implementing Regulation. Are the protection measures set out in the plan proportionate to the hazards presented? Are the conditions for carrying out the tasks indicated in the planned measures.	
External emergency plan	Are the protection measures specified in the external protection plan proportionate to the hazardous effects specified by the operator. Are the conditions for carrying out the tasks indicated in the planned measures.	Official procedures. Preparation and qualification of an external security plan.
Safety management system	The quality control requirements (criteria system) are set out in the official procedures	Official procedures. Verification criteria (list of questions)

Disaster Management
CBRN Mobil Laboratories

Tasks:

- Monitoring the territory endangered
- Measure the expected hazard of the public and material assets
- Collecting and forwarding the data and information about hazards
- Cooperation in early warning of the public
- Permanent information linking among the participants of response
- Cooperation in rescue tasks
- Cooperation with the professional municipal fire-brigade in measuring the damages, rescue work in case of accidents, involving dangerous substances
- Cooperation with the staff of the competent rescue team in case of accidents, involving dangerous substances

Presentation of industrial safety training requirements

N.	Industrial safety competences	Edutation and training requirements
1.	Expert who prepares operational safety documentation (safety report, safety analyses, major emergency response plan, internal emergency plan)	Government Decree 219/2011 (X. 20.) on the prevention of major accidents involving dangerous substances. point 6.2 of Annex 7 - higher technical qualification, - advanced professional qualification in disaster management, civil protection or fire protection; and - at least five years' professional experience. For the assessment of major-accident hazards, software used in generally accepted international practice and approved by the central body of the authority shall be used.
2.	Hazardous industrial safety officer	Government Decree 219/2011 (X. 20.) point 6.3 of Annex 7 - with a mid - level professional qualification in disaster management, civil protection or fire protection, or - dangerous industrial safety administrator training course is required.
3.	Security Liaison officer	Act CLXVI. of 2012. évi 6. § (7) and Gov. Decree 65/2013. (III. 8.) with a higher education degree in industrial safety or at least 5 years of experience in the field of industrial safety at professional bodies in the field of disaster management.
4.	Dangerous goods officer	In accordance with the sectoral transportation regulation the person coordinating the transport of sectoral dangerous goods.
5.	Radiation protection course qualification	Government Decree 487/2015 (XII. 30.), on protection against ionizing radiation and the related licensing, reporting and control system.

Disaster Management Higher Educational system

- **BA – Disaster Management (2013)**

  Specializations:
  - **Disaster management operations**
  - **Fire protection and rescue operations management**
  - **Industrial safety**

- **MA: Disaster management (2016)**
- **Law enforcement specialized vocational training (from 2020)**

- **Bsc: Fire safety engineer (from 2022)**
- **PhD: Military Technical Doctoral School Disaster Management Research Section**

Result and Conclusion

- In this article, the authors examined the technical competencies associated with industrial safety responsibilities.
- It can be stated that industrial safety tasks make it necessary to apply specific legal and technical requirements.
- Operator's compliance with technical requirements is accompanied by specific educational qualification requirements.
- The higher education system of the University of Public Service provides decisive help in the development of these technical competencies.

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[4] Cimer Zsolt et al. Ipari biztonsági kockázatkezelési kézikönyv Budapest, Magyarország : KJK-KERSZÖV Jogi és Üzleti Kiadó Kft. (2004) , 227 p.

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Section E – Safety and security


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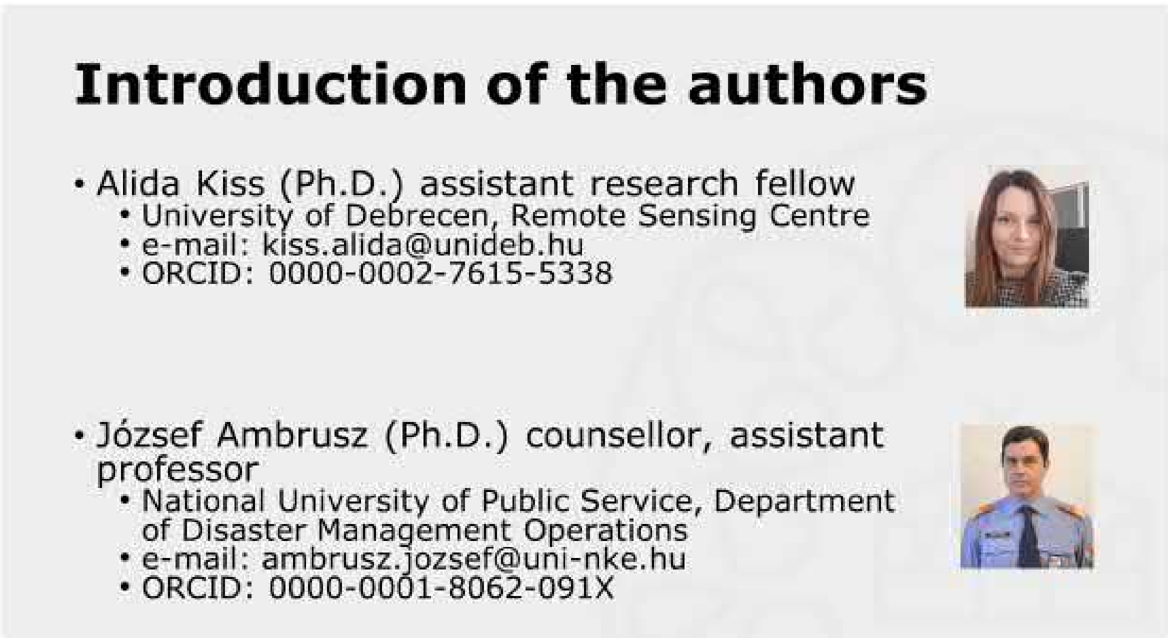
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Scientific research difficulties of post-earthquake rehabilitations
Alida Kiss[1] – József Ambrusz[2]
[1]University of Debrecen, Remote Sensing Centre
[2]National University of Public Service, Department of Disaster Management Operations
VÉDELEM ONLINE


Introduction of the authors
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• e-mail: ambrusz.jozsef@uni-nke.hu
• ORCID: 0000-0001-8062-091X

Contents of the presentation

Abstract

- The estimated damage values of the recent earthquakes in Croatia (Zagreb and Petrinja)→ worthwhile to examine the neighboring countries.
- Idea of benchlearning continuing to study → with the neighboring countries, in this case Croatia
- Promote mutual learning

Introduction
Recent earthquakes in Croatia

- 22nd March 2020, Zagreb (capital of Croatia)
  - earthquake of M5.5
  - "hub" of the pandemic in the country
- 29th December 2020, Petrinja
  - earthquake of M6.2
- The Croatian government is currently facing a multifaceted emergency.

Destructions caused by the Earthquakes in Croatia

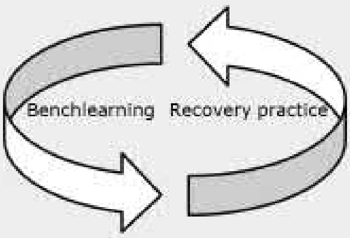
Source: https://gulfnews.com/photos/news/croatia-quake-strikes-north-of-zagreb-damages-buildings-1.1584854619147?slide=2

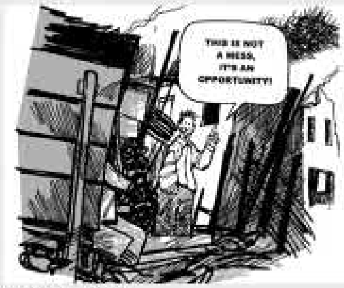
Source: https://www.travelagentcentral.com/destinations/zagreb-croatia-gets-hit-by-5-4-magnitude-earthquake

Source: https://www.irishtimes.com/news/world/europe/at-least-17-injured-in-biggest-tremor-to-shake-zagreb-in-140-years-1.4209147

Introduction
Post-disaster-recovery difficulties and benchlearning opportunities

- Decisions must made ←→lack of time and resources
- Restoration of the infrastructure, housing, and public services
- Benchlearning: to learn from the strengths of others, collect ideas, review them, and avoid bad practices.





Fonte: Monday (2002)

Methods

- A secondary research, literature review and report content analysis were implemented with a focus on the characteristics of post-disaster rehabilitations and benchlearning opportunities connected to Zagreb's recent earthquakes.
- Relevant papers, reports, datasets were scrutinized from the search results.

Google

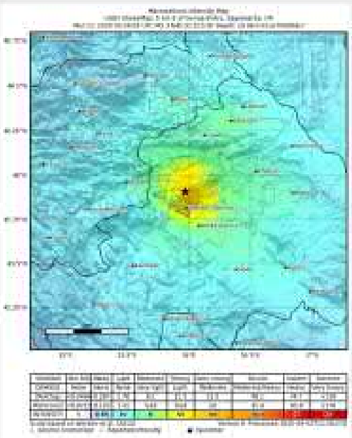
Research Gate

Elsevier ScienceDirect

EM-DAT

Research key words:
- "earthquake in Croatia",
- "reconstruction after the earthquake in Croatia",
- "post-disaster reconstruction",
- "seismic risk assessment in Croatia",
- "reconstruction in Croatia",
- "Croatian disaster management",
- "Croatian civil protection",
- "benchlearning" and their different synonyms.

Discussion and Results
Reconstruction after the Zagreb's earthquake

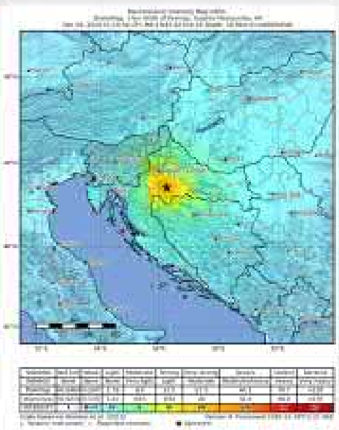


Source: United States Geological Survey - https://earthquake.usgs.gov/earthquakes/eventpage/us70008dx7/shakemap/intensity

Major earthquakes in the Zagreb area

Date	Epicenter (in relation to Zagreb city center)	Magnitude (Mw)	Intensity (MCS)
9 November, 1880	estimated at 12 km	6.3	VIII
17 December, 1901	estimated at 12 km	4.6	VII
17 December 1905	estimated at 12 km	5.6	VII-VIII
2 January, 1906	estimated at 12 km	6.1	VIII
3 September, 1990	10 km north-northwest	4.7	VII
22 March, 2020	7 km north-northeast	5.5	VII-VIII
29 December, 2020	48 km southeast	6.4	

Source: Own editing (2021) based on Government of Croatia and Word Bank (2020) and IntMedCorps-Croatia (2020)



Source: United States Geological Survey - https://earthquake.usgs.gov/earthquakes/eventpage/us6000d3zh

Discussion and Results Reconstruction after the Zagreb's earthquake – Damages and losses

	Damages and losses by sector (in million EUR)	Damages	Losses	Total	Summary of recovery and reconstruction needs (in million EUR)	Short-term	Medium-term	Long-term	Total
Housing		6 881	364	7 245		2 739	4 102	2 287	9 128
Health		826	61	887		374	210	1 851	2 435
Education		1 071	9	1 080		571	881	909	2 361
Culture and Cultural heritage		1 378	21	1 399		500	1 570	447	2 517
Business		505	184	689		338	351	339	1 028
Total		10 661	639	11 300		4 522	7 114	5 833	17 469

Source: Own editing (2021) based on Government of Croatia and Word Bank (2020)

Discussion and Results Opportunities for benchlearning

- The difficulties of adapting international "best" practices in Hungary may be due to the fact that Hungary has different characteristics in many areas compared to countries appearing in international research
- It is probably easier to identify what and how we can learn from each other if implemented in a similar system.
- Fundamental problem, that international cooperation needs to be strengthened not "only" from the point of view of assistance, but also of scientific experts.

Conclusion

- Disater management requires a more flexible response system on the part of the EU.
- Mutual European solidarity must be strengthened.
- As a continuation of the research, it is possible to develop exact parameters, map rehabilitation practices along them and share them on a common international platform in order to learn from and adapt to the strengths of others

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Security environment – theoretical model in Polish security sciences
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UNIVERSITY OF PUBLIC AND INDIVIDUAL SECURITY "APEIRON" IN KRAKOW, POLAND


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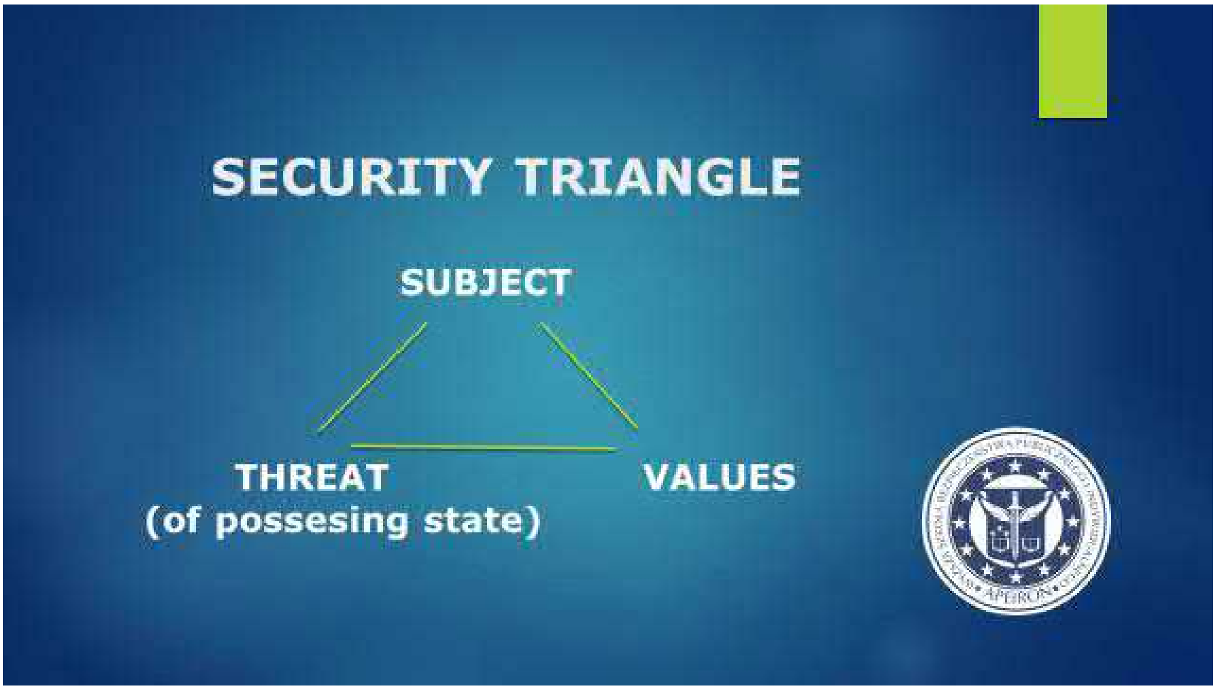
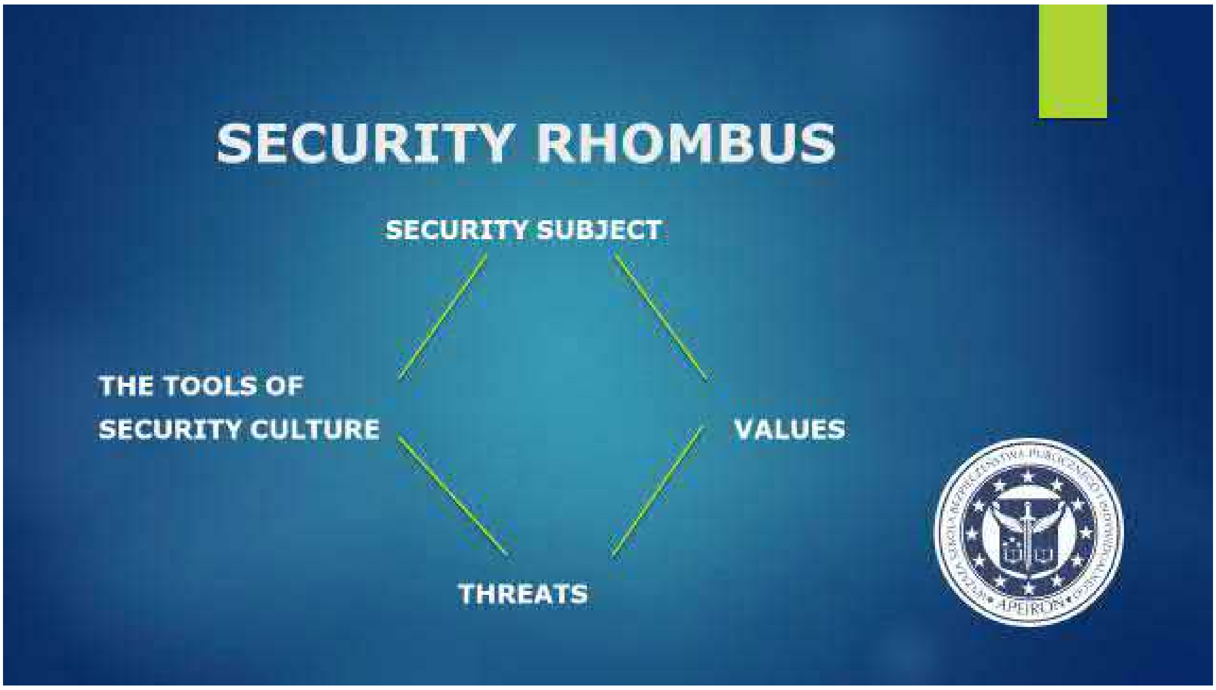
SECURITY SCIENCES

- dichotomy of security and threats
- anthropocentric approach
- **security environment**

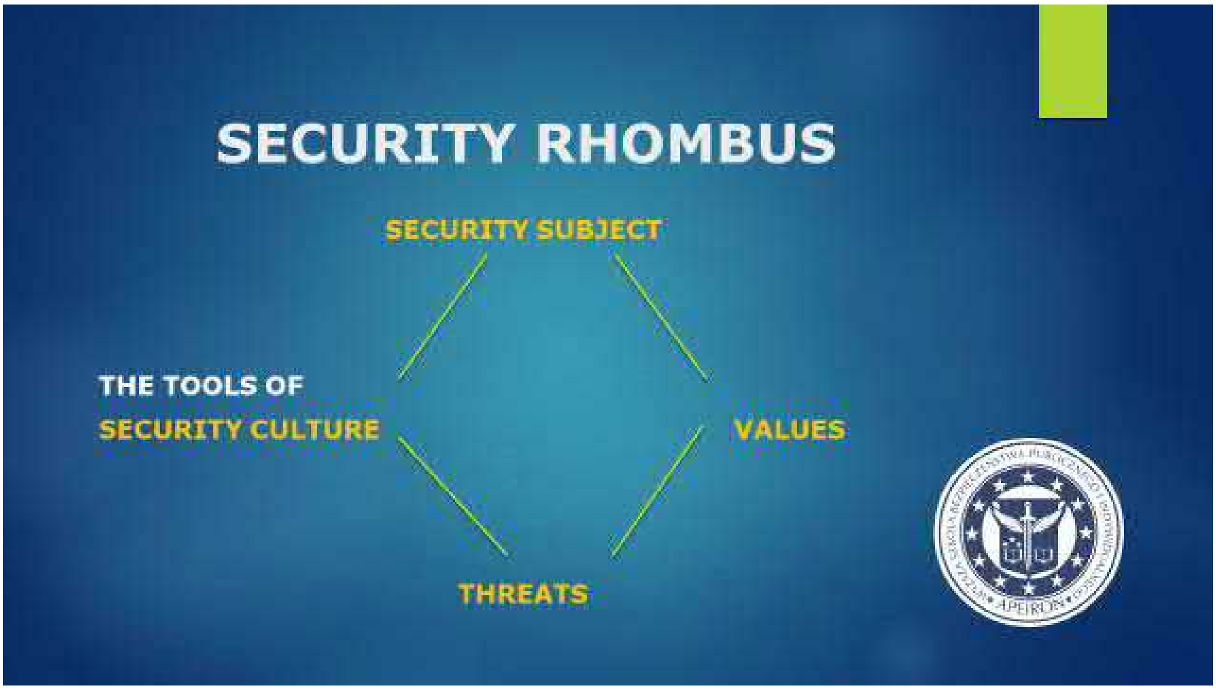
THE NARROW DEFINITION OF SECURITY ENVIRONMENT

- **OPPORTUNITIES of security subject**
- **CHALLENGES of security subject**
- **RISKS of security subject**
- **THREATS of security subject**


SECURITY TRIANGLE
SUBJECT
THREAT
(of possesing state)
VALUES


SECURITY RHOMBUS
SECURITY SUBJECT
THE TOOLS OF
SECURITY CULTURE
VALUES
THREATS


THREE DIMENSIONS OF SECURITY CULTURE
mental and spiritual
(individual dimension)
legal and organizational
(social dimension)
material


SECURITY RHOMBUS
SECURITY SUBJECT
THE TOOLS OF SECURITY CULTURE
VALUES
THREATS
APEIRON


THE NARROW DEFINITION OF SECURITY ENVIRONMENT
OPPORTUNITIES of security subject
CHALLENGES of security subject
RISKS of security subject
THREATS of security subject
APEIRON


THE BROAD DEFINITION OF SECURITY ENVIRONMENT
security subject (time of action, space of existence, influences and interrelations)
values
threats
security culture ("social and material tools")
needs and development
opportunities
challenges
risks
APEIRON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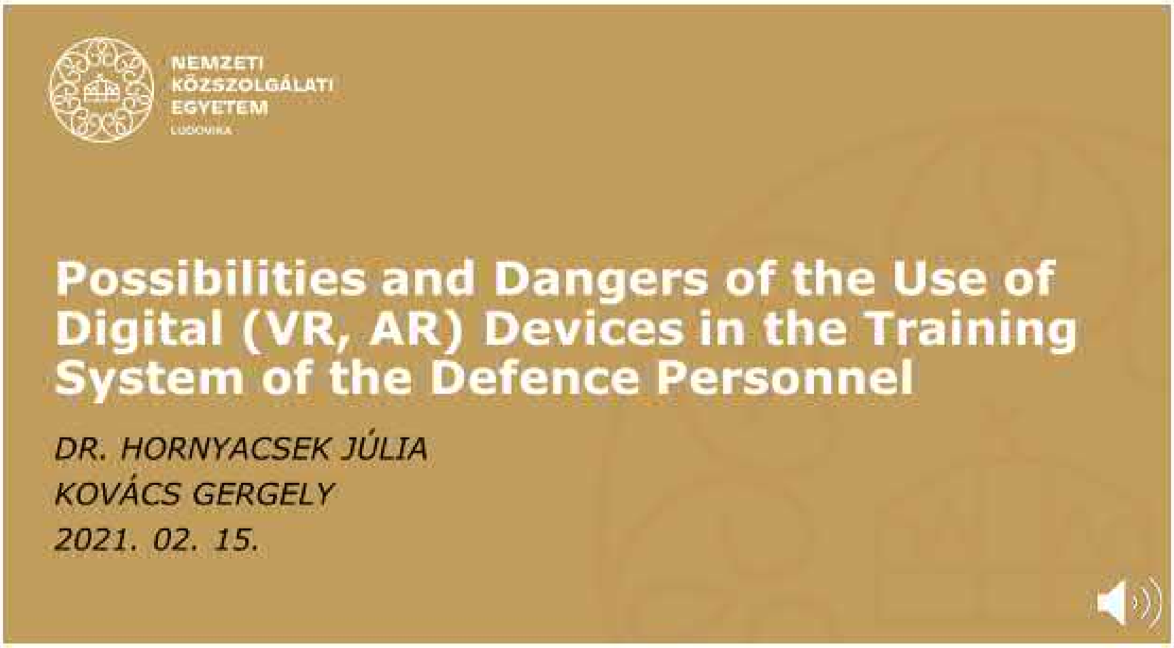
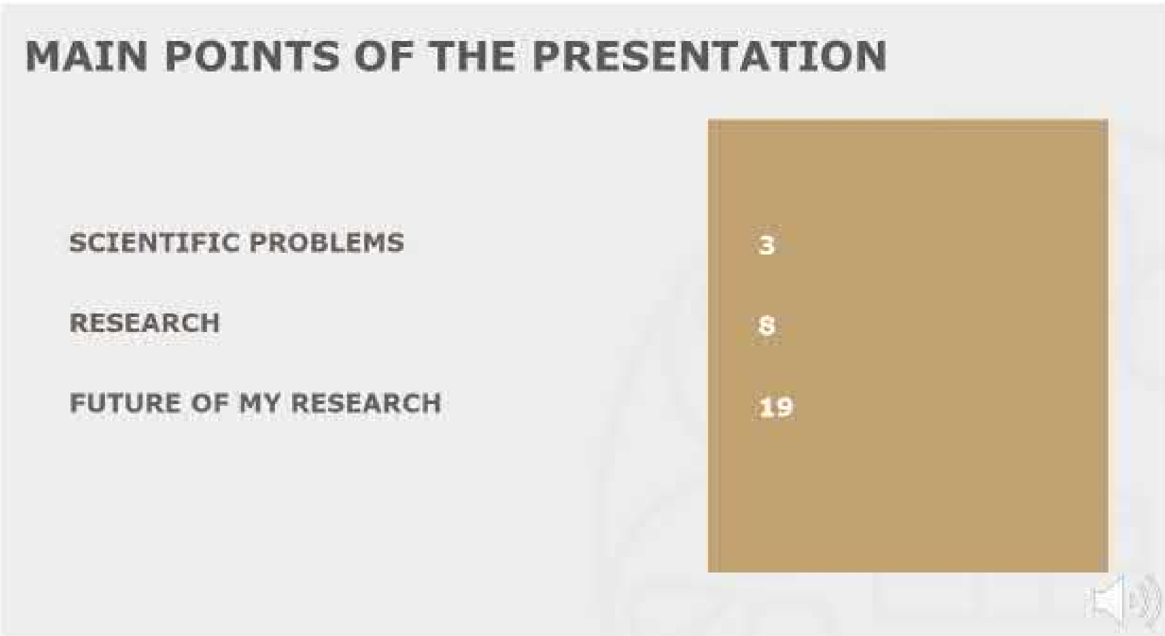
13–14 May 2021, Krakow, Poland


NEMZETI
KÖZSZOLGÁLATI
EGYETEM
Possibilities and Dangers of the Use of Digital (VR, AR) Devices in the Training System of the Defence Personnel
DR. HORNYACSEK JÚLIA
KOVÁCS GERGELY
2021. 02. 15.


MAIN POINTS OF THE PRESENTATION
SCIENTIFIC PROBLEMS
RESEARCH
FUTURE OF MY RESEARCH
3
8
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NEMZETI KÖZSZOLGÁLATI EGYETEM
LUDOVIKA

1. Formulation of the scientific problem

Scientific problem



It is not only the civil sector that is responsible for the level of environmental impact, but also the defence sector, and it has a particular responsibility to reduce environmental pressures. The effectiveness of defence work and the protection of the population is also 'asset dependent'.

These require the most circular methods, procedures and technology.

Scientific problem

Oculus Quest 1

Oculus Quest 2

The current digital development is so widespread that the range of technologies that can be used is unprecedented. Testing the use of new technologies, such as AR/VR, is an extremely under-researched area. The efficiency and usability of the devices used in the defence sphere are "device dependent". In order to work efficiently, the most circular methods, procedures and technology are required, so the advantages and disadvantages of new tools need to be examined.

Scientific problem

The technological, psychological , ergonomics and physical aspects of the use of 3D display devices in the defence sphere have not been widely publicly studied. The use of AR devices in the defence sphere is based on the examination of decision support mechanisms and the use of VR devices is based on the analysis of the training system and the mapping of the digital tools used there.

Research

1 On the basis of preliminary research, We assume that the use of modern digital tools and procedures reduce the environmental impact of the defence sector, while allowing for more effective implementation of basic defence tasks in the areas of training, decision support and defence.

2 We assume, that modern digital tools already proven in the civil sphere, can be used effectively in the defence sphere and can be used in a number of areas, in particular training, reconnaissance, decision support, defence and rescue.

3 We assume, that these tools will help to increase situational awareness during military deployment, damage control and field work, and that their use not only has positive, but also has physical and psychological risks that can be minimised by proper preparation.

Partial results so far

Sub-research 1 - conclusions

With Dr Hornyacsek we have identified the damage area characteristics and the tasks to be carried out there. By analysing traditional tools and training tools that support operational activities, We found that AR and VR can be successfully used in several areas of digital tools used in the civil sphere.

We tested the simulators currently in use, Microsoft Hololens, Vuzix AR, Oculus Go, Oculus Rift, Oculus Quest glasses, and identified the pros and cons of using the devices. We was the first to identify differences and similarities between traditional and modern IT tools based on 14 VARIABLES, and We did a comparison in these areas.



Partial results so far

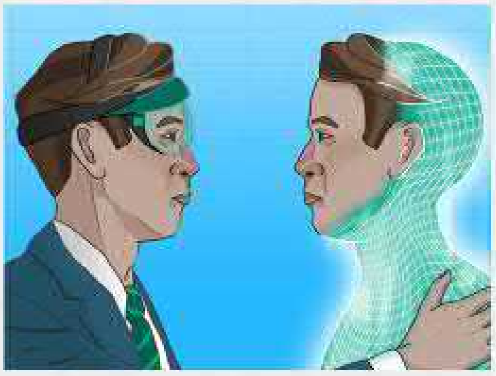
Sub-research 2 - conclusions

- Looking at the advantages, AR-VR can have reducing environmental pressures. We found that in the chemical, technical, population protection, logistics areas, environmental pressures were reduced by 25-30%, the efficiency of protection and rescue forces increased.
- **VR procedures in the field of training shortened the training process, reducing the environmental impact by 5-10 % compared to real-world exercises.**
- Looking at the types, methods and areas of AR VR digital devices used abroad, We found that an adaptation test is required for systemization.
- We have identified the variables of adaptation: legal background, cost, number, type, application protocols, preparations, necessary skills, etc.

Partial results so far

Sub-research 3 - conclusion

- We have identified physical, logical, and cognitive hazards.
- We analyzed the cybersecurity challenges of new types of AR/VR digital devices and identified threats like: 3D scan, Deep Fake Persona, off-the-shelf devices
- We have proposed forms to increase cybersecurity, such as the use of closed networks, and VR simulators should be classified as electronic information systems for defence purposes.

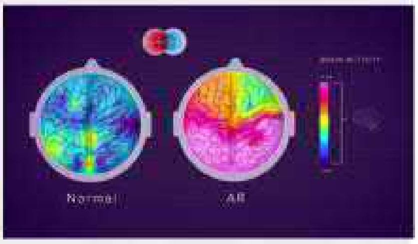


Partial results so far

Sub-research 4 - conclusions

By analyzing the psychological effects associated with the use of virtual space, physical exertion, and the effects of "cyber disease", I found that:

- When using AR/VR devices, you will have to meet the usual physical challenges. From a neurological point of view, movement and work in cyberspace can cause negative symptoms.
- Cyber disease affects the task: concentration, reflexes and work capacity.
- We suggested the use of the term virtual ergonomics and defined its parameters.



Hypotheses

1. On the basis of preliminary research, We assume that the use of newer modern digital tools will better reduce the environmental impact of the defence sector, while newer tools will make the implementation of basic defence tasks more effective in the areas of training, decision support and defence.
2. We assume that modern digital tools already proven in the civil sphere can also be used effectively in the training of the defence sector. We assume that the digital devices used in the current training can be complemented by new VR devices and integrated into the training system.
3. We believe that modern digital tools already proven in the civil sphere can also be used effectively in the training of the defence sector. We assume that the digital tools used in the current training can be complemented by a new type of AR integrated into the training system.

Sub-research 5 - conclusions

ON THE BASIS OF THE ANALYSES CARRIED OUT IN THE COURSE OF THE INVESTIGATION, WE HAVE REACHED THE FOLLOWING CONCLUSIONS:

We have researched the system of military training, including the structure, areas, methodology and traditional and digital teaching tools used there, which We interviewed with key experts in the field.

Our conclusion: New challenges and expectations such as Mission Command require a new type of training and methodology. AR/VR glasses can be an efficiency-enhancing tool for these types of trainings, thereby reducing environmental impact.

AR/VR Applicability: In the new type of training system, VR/AR solutions or technical equipment can effectively develop the skills of the staff to be trained, bearing in mind the demands of new challenges.

Sub-research 6. - conclusions

ON THE BASIS OF THE ANALYSES CARRIED OUT IN THE COURSE OF THE INVESTIGATION, with my supervisor Dr Hornyacsek we have **REACHED THE FOLLOWING CONCLUSIONS:**

We have researched the system of disaster management, including the structure, areas, methodology and traditional and digital educational tools used there.

Our conclusion: The staff must have adequate response skills to new environmental requirements and new types of challenges. In order to properly practice theoretical training and methodology, it is necessary to expand practical training, which is almost impractical because of the limitations of environmental standards, due to the diversity and cost of tasks and scenarios.

AR/VR Applicability: Due to new environmental requirements and limited opportunities, VR/AR solutions in the training system can effectively provide a solution to support the training system.

Research methods

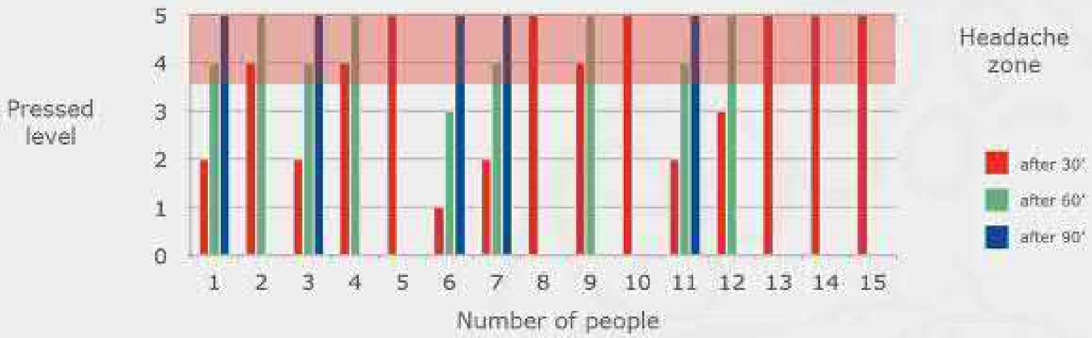
- We used guided in-depth interviews to collect primary data
- We did statistical analyses
- We attended professional meetings and online conferences
- We did a comparative analysis of VR, AR devices: Hololens 1 vs. Hololens 2, Oculus Quest 1 vs. Oculus Quest 2.

US soldiers testing the new Integrated AR System IVAS (Integrated Visual Augmentation System)

Earthquake VR simulator in Japan

Virtual reality and haptics are helping firefighters train

Physical exertion of the user while using Oculus Quest 2 VR glasses.



- We studied the physical exertion of the user while using Oculus Quest 2 VR glasses.
- 15 people tested, 15 of 11 after aprox 30 minuntes reported that the device was pressed on their head while using VR glasses and it was uncomfortable to wear. So the current support structure is not suitable for several hours of wear/training.
- Problems were less common after proper preparation and instructions for use

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EGYETEM
LUDOVIKA

3. Planned continuation of research

Expected results

1. MATRIX-BASED DESIGN – In the defence sphere, the preparation of a usability matrix in the technical, logistical and chemical fields, showing their environmental negative effects, assigning AR/VR IT tools to help reduce environmental impact more effectively

2. METHODOLOGY BOOK FOR USE - Compiling training material to prepare for the use of equipment (in the field of military and disaster management and humanitarian organisations). Create a collection of Logistics, Technical and CBRN scenarios designed for the VR platform that reduces environmental impact in the defence sector

3. ADAPTATION TEST REPORT - Compilation of a repository, methodology and related test report for the introduction and adaptation of AR VR tools in the field of Hungarian defence and disaster management (collection of legislative changes, economic, IT and preparation conditions, methods)

4. NORM BOOKLET - Summary of virtual reality and augmented reality applications in emergencies and during protection activities, definition of application requirements, preparation of a collection of physical and psychological effects associated with wearing AR/VR devices, and, on this basis, the preparation of the operational proposal.

Summary, Results

The literature, conferences and publications researched during my research clearly point in the direction that VR devices will be an essential part of the defence training system and that AR devices will play a similar role in operations in the future.

In my research the comparison and examination of the most recent and long-standing tools examined, including the Hololens 2 AR glasses to be used in the US military in 2021, gives an accurate picture of the development results of the past two years and demonstrates that not only have technological advances been made, but newer tools can also make progress in areas such as ergonomics and work psychology (cyber-disease) for effective use.

Our result clearly demonstrate that these devices have a place in the domestic defence sphere. In-depth interviews and examinations carried out (KOK, NKE HHK, HM, MH Academy)) demonstrate that the use of these tools can be integrated into the training system of the Hungarian defence sector and be used in the execution of operations, with suitable preparation and a plan based on the intended USE MATRIX, the USE METHODOLOGICAL BOOK, the ADAPTATION TEST REPORT and the NORMA BOOKLET. In particular, interviews and experiment have shown that the use of the tool would be positively received.

NEMZETI KÖZSZOLGÁLATI EGYETEM

LUDOVIKA

THANK YOU!

DR. HORNYÁCSEK JÚLIA, KOVÁCS GERGELY

2021. 02. 15.

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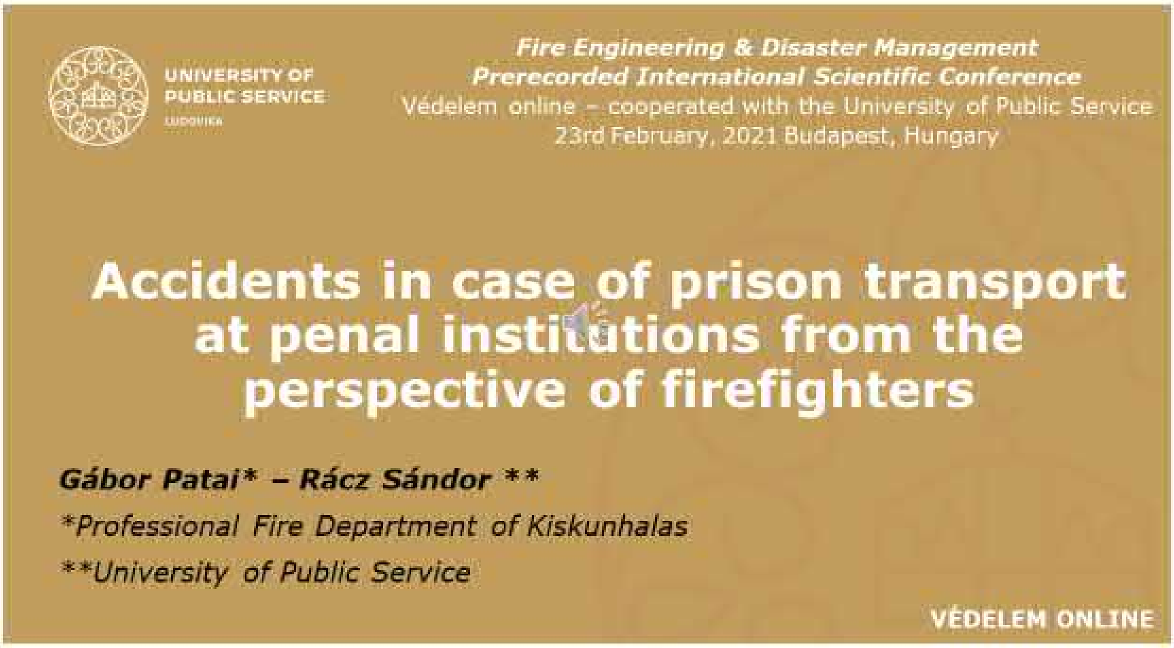
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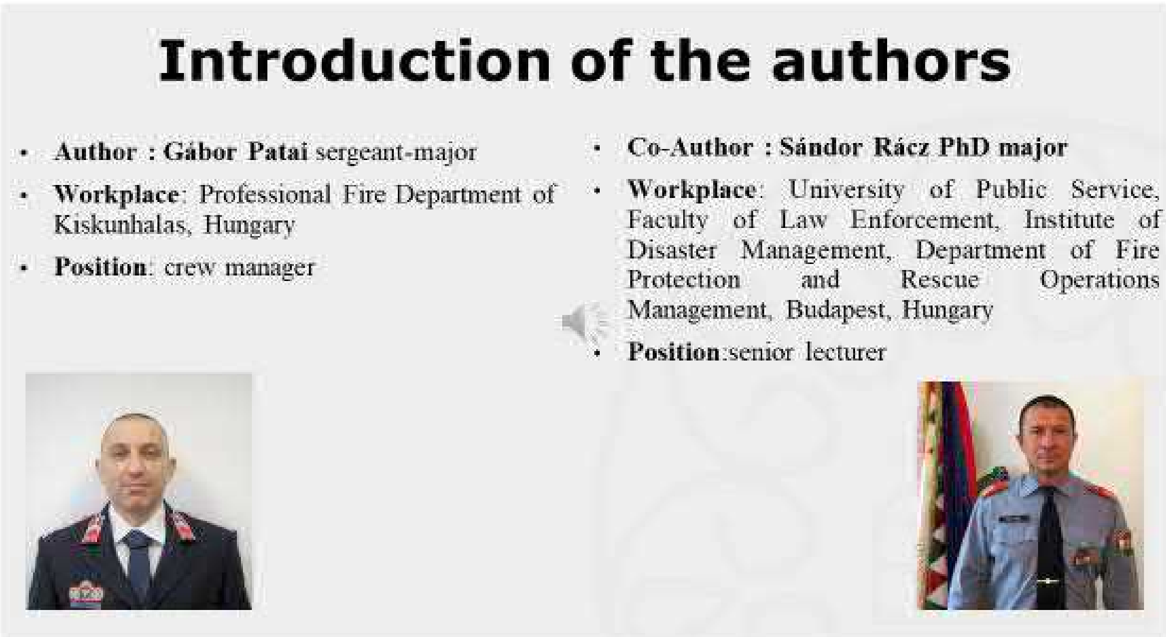
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Accidents in case of prison transport at penal institutions from the perspective of firefighters
Gábor Patai* – Rácz Sándor **
*Professional Fire Department of Kiskunhalas
**University of Public Service
VÉDELEM ONLINE


Introduction of the authors
Author : Gábor Patai sergeant-major
Workplace: Professional Fire Department of Kiskunhalas, Hungary
Position: crew manager
Co-Author : Sándor Rácz PhD major
Workplace: University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management, Budapest, Hungary
Position:senior lecturer

Contents of the presentation

- **Abstract** – a short introduction of the topic
- **Penal institutions–**Levels of the institutions
- **Logistic –** short presentation of the transport of the prisoners
- **Dangers of accidents in case of prison transport–** two types of danger
- **Questionnaire–** presentation of results
- **Summary -** Results, conclusions
- **References**

Abstract

The increase in the number of vehicles in Hungary also attracts the increase of the related accidents [1]. Fire departments are responsible for the elimination of these accidents. Firefighters need to be prepared for more effective and safer intervention, which must be constantly extended in line with technical progress [2]. In addition to the technical progress, special situations can also be a problem. Accidents involving prison transport have a higher safety risk to the firefighters that the other road accidents. The quick, efficient and safe elimination of accidents requires proper preparation of the interveners, so the expansion of their theoretical and practical knowledge, and the development of their methodology is also important.

Penal institutions

- Jail
- Prison
- Penitentiary
- Regime

Figure1 – Prison cell
Source:
https://ujszo.com/sites/default/files/styles/pl_article_full_lead/public/lead_image/bort on-1024x683_0.jpg?h=199d8c1f

[3] [4]

Logistic

- circular transport [5]
- special transport
- delivery plan
- seating chart

Figure2– Rabomobil
(Source:https://m.blog.hu/he/helsinkifigyelo/ima ge/rabomobil2.JPG

[7]

Dangers of accidents in case of prison transport

Prisoners

Figure 3 - Prisoners
(Source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQ1xdagElIT2fflyv8vwwRS34HZOJZfu64qFA&usqp=CAU

Weapons

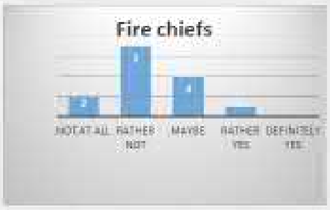
Figure 4 - Weapons
(Source: https://srilankamirror.com/media/k2/items/cache/f098f36eba9b964449f01fde2818ef52_L.jpg

[6]

Questionnaire

theoretical knowledge

practical knowledge



Questionnaire

Danger

Safety

Summary

- Special training
- Expanding the knowledge
- Increase security

Figure 5 – Expanding the knowledge. Source: https://thumbs.dreamstime.com/z/learning-theory-practice-orange-white-crossword-puzzles-series-42413595.jpg

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Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
Involvement of animal rescue organizations in disasters
Katalin Berta
NKE KMDI, PhD student
VÉDELEM ONLINE


About me
Professional background
• Active participation in disasters since 2001
• Animal rescue in case of flood
• Animal rescue in case of red sludge
My research
• 2006: KRF TDK (Scientific Student Conference)
• 2013: NKE TDK(Scientific Student Conference)
• 2015: NKE OTDK(National Scientific Student Conference)
• 2019: NKE TDK(Scientific Student Conference)
Currently
• Metro Civil Defence – lecturer, instructor
• UPS Doctoral School of Military Engineering - PhD

Contents of the presentation

Introduction

My more than twenty years of animal rescue experience has led me to examine the role of civilian animal rescuers in disasters. According to the law, animal rescue is a technical rescue, yet in recent years, professional authorities have increasingly sought the help of civilians. The legislation gives the rescue manager the opportunity to involve other organizations in the rescue, but this also needs to be improved in terms of legislation and practical application.

Research methods

- Previous backup analysis
- Study of legislation
- Study of international literature
- Own experiences

Applicability of volunteers

- Act No. CXXVIII of 2011 concerning disaster management and amending certain related acts.
- Special tools
- Competence (ethological knowledge of different animal species)
- Complement the rescue work
- Reducing the workload of professional staff
- Reducing the risk

Animal rescue thematics

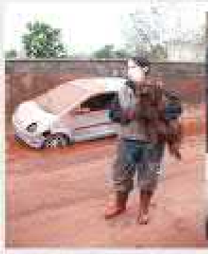
- Situation analysis – species, how many individuals, damage
- Human resource
- Financial base
- Equipment
- Cooperation

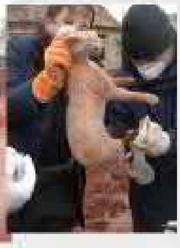
Own incident
Flood Gemenc in 2002

- 7 organization – 45 staff
- Cooperation between Animal rescuers-Councils-National Directorate of Disaster Management – Forestry
- Animal rescue organizations voluntarily participated in the rescue, based on unofficial notification.

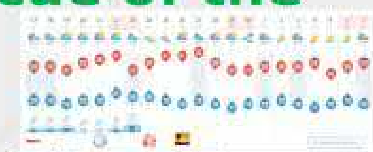
Red sludge disaster in 2010

- First animal rescue team
- Based on official notice
- Direct contact to the mayor and to the authorities
- Accurate check-in system
- Animal recuers receive support
- Rescue work with the Civil Protection
- Difficult placement→
  quarantine yard needed





Weather disaster (rescue of the red listed animal)



- White stork nest – rainy weather for a long time
- Competency of the National Park, and registered animal rescue station
- Special civil organisation request assistance from the Disaster Management
- Hesitation and rejection by the authorities
- The principle didn't apply: without intervention, the animal may die
- Other risks (E-ON pylon, syren)
- Animal rescuers know the speciality, anatomy, ethology of the animal species

Conclusions

- Voluntary animal rescue organizations are effective complements to professional disaster management authorities, but their participation is not yet automatic.
- Designation of a deployable animal welfare organization by the Disaster Management that would be officially alerted in cases of damage where an animal is endangered or endangered by an animal.
- Establishment of a national organization network (umbrella) with county organization members.
- Involving the regional/active animal rescue organization by adducation of natural disaster.
- Voluntary veterinary service in the event of disasters.
- Education reform needed, with experts, veterinarians, foresters and animal rescuers.

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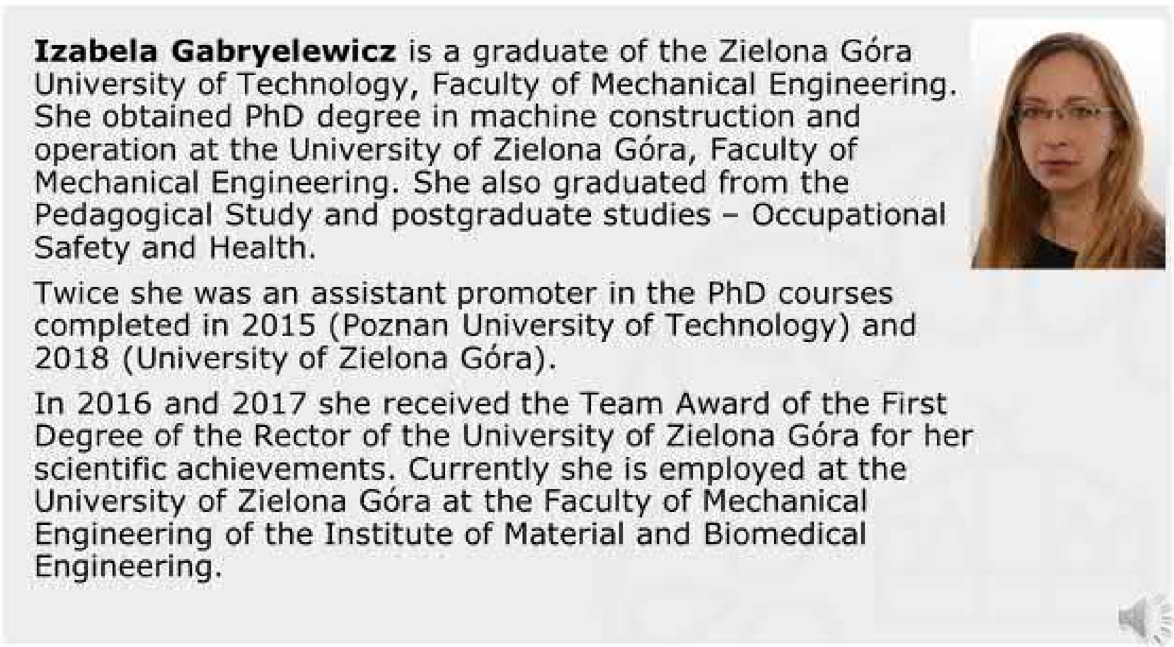
Izabela Gabrielawicz - Patryk Krupa - Péter Pántya: Safety management in terms of the level of safety culture in uniformed services



Patryk Krupa is a graduate of the Zielona Góra University of Technology, Faculty of Mechanical Engineering. He obtained his PhD degree in Production Engineering at the University of Zielona Góra. Currently, he is employed at the University of Zielona Góra at the Faculty of Mechanical Engineering of the Institute of Material and Biomedical Engineering.

Main areas of scientific interest: work safety, work safety culture, ergonomics in shaping working conditions, analysis of threats in the work environment, safety of work in the technology of works under voltage.

Interests: safety culture, Internet technologies, ergonomic design

Peter Pantya, PhD., Associate Professor, Lt. Col.

pantya.peter@uni-nke.hu

Péter Pántya began his studies in 2003 at the Tessedik Sámuel College (BSc degree in human affairs) later continue at the Miklós Zrínyi National Defence University (MSc an BSc) for Defence Administration Organizer (Disaster Management, Fire Protection and Firefighter) He began his PhD studies in 2008 at the Doctoral School of Military Engineering at the Miklós Zrínyi National Defence University. He is currently an associate professor at the Institute for Disaster Management of the Faculty of Law Enforcement at the University of Public Service.

He is also have a habilitation.

His research topics are: fire and disaster management actitivities, technical equipment, and the raising of the efficiency of the fire organisations at the incidents.

Structure of the presentation

1. Abstract of the presentation
2. Methods of the investigation
3. Demonstration of the results
4. Conclusions and Discussion about this issue in the field of safety culture in uniformed services
5. List of the references used for this investigation and publication

Abstract

The presentation describes the results of a research on safety climate level in an Army Unit located on the territory of Poland. The research has been carried out with the use of author's questionnaire to measure safety climate level. The results are presented by the means of Safety Culture Grid and there have been determined safety level indicators in various companies. The questions in the questionnaire are characterized by firm connection to designate of high safety culture. The results of the survey can be used to diagnose safety state in the context of human behaviour. Detailed analysis of the results allows to pinpoint weak and strong aspects of work safety. This enables one to undertake preventive and (or) repair actions adjusted to specific areas and worker groups.

Methods

The research has been carried out with author's questionnaire devised by Izabela Gabryelewicz and Prof. Edward Kowal from the University of Zielona Góra. The IT tools were developed by University of Zielona Góra employee Patryk Krupa. The developed application enables for fast, multi-directional analysis of the collected data. The developed application has an open form which can be expanded with additional applications [3]. The collected data comes from research carried out by Bartosz Czycz in his thesis, written under supervision of I. Gabryelewicz [1, 8, 9], Klaudia Kubicka in his thesis and Piotr Flasza in his thesis, written under supervision E. Kowal. The research was carried out between 2015 and 2018. The research covered a three groups of soldiers: first group: 50 soldiers, second group: 85 soldiers, third group: 96 soldiers.

All the charts in the form of Safety Culture Grid include nine subject categories of safety culture. On the legs of the chart there is presented safety climate level in a given subject group. On the grid the values are presented in percentage scale. Each factor has assigned some value which then is marked on the grid [4]. The plan made by connecting single points gives information about percentage share of each factor in shaping safety culture level in a company [5].

By counting the ratio of the whole grid to the area determined by the points marked on the the grid we get so called safety culture level indicator [2].

Determining this indicator allows to compare safety culture level with other companies or among researched employee groups, both within a company as well as among various companies but with regard to similar employee groups.

To be able to precisely choose methods that will allow to increase safety culture level, and thus to decrease the number of accidents and at the same time to increase the level of safety in a company there is required an analysis with regard to group of surveyed employees. Therefore, the following part of the paper presents safety climate level with regard to: total seniority, seniority in the researched workplace, employee's education, position held.

The results of the research end with a charts presenting general safety climate level.

Results

The first researched factor that can influence safety climate level in a company was seniority. The research was carried out with regard to: total seniority and seniority in the current facility.

Total seniority Figures presents indicators of safety climate level with regard to total seniority. It shows very big diversity of the results. The lowest level of safety climate is shown by people with 3 to 5 years of service - the ratio is 0,38, 0,38 and 0,36. The highest level is presented by people with the longest time of service, over 20 years - the ratio is 0,65 and 0,44. This may indicate the need for additional motivational methods (training) for the group of people with 3 to 5 years of service.

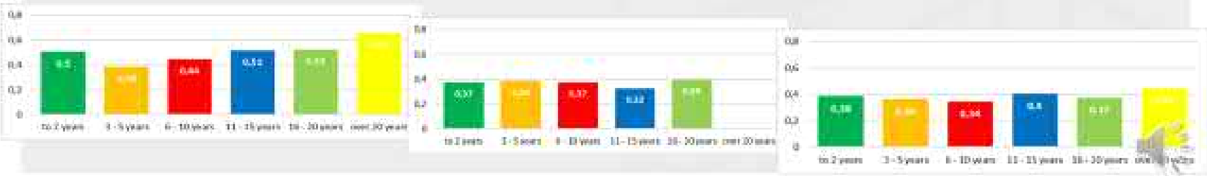
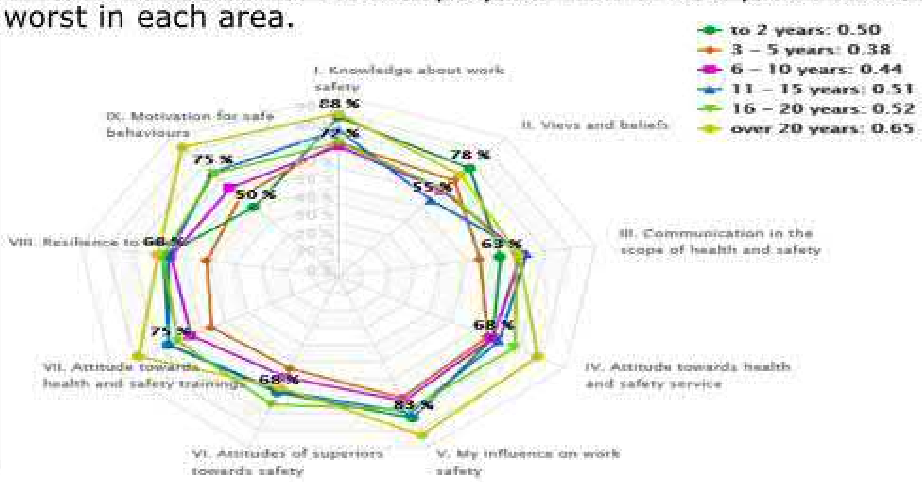


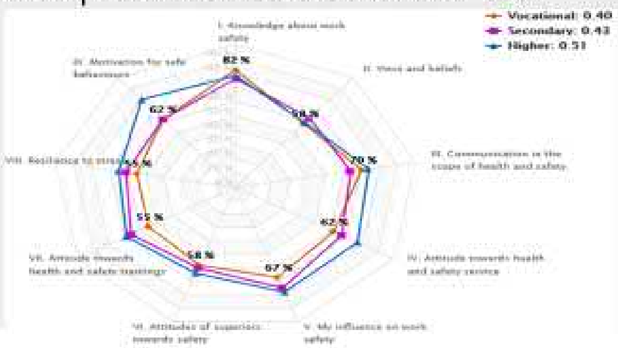
Figure presents in the form of a Safety Culture Grid the level of safety with regard to total work experience in the researched facility. We can read from it the information in which subject group, which surveyed group of employees with regard to their total seniority requires corrective or repair actions. It seems that employees with 3 to 5 years of service are the worst in each area.



Seniority in the researched workplace

Figures presents indicators of safety climate level with regard to seniority in the studied workplace. The good thing is that there is an increase in safety climate level together with increasing seniority in the studied facility. This shows high impact of company culture on the general safety climate level presented by its workers. So as company culture influences the level of safety climate in a company, in the same way company climate (being a part of company culture) influences the level of safety climate on a given position [6].

Employee's education Figure presents safety climate level with regard to education. Indicators of safety climate are on similar level. Irrespective of the level of education, the lowest level of safety climate appears to be in the group of questions regarding - Values and beliefs. The questions from this group referred to personal beliefs of an employee about safety issues. From the low results in this group one can infer that the employees are not fully convinced about possibility of safe work and they think that health and safety rules make their work harder. They are also convinced about the relationship between safe behaviour and remuneration.



The general level of safety climate is shown on figures. It is visible that the highest level of safety climate is in the area - Knowledge of Health and Safety in the facility (77%) and in area - My influence on safety (76%). This speaks well about organized trainings and courses in the field of Health and Safety, and well conducted informational campaign about safe behaviours and applying good practices in the field of work safety. The researched facility shows the lowest safety climate level in category - Supervisor's attitude towards safety (62%), Resistance to stress (63%) and, with exactly the same result in the category - Values and beliefs.

Discussion, Conclusions

The main conclusion after the research is the necessity to improve Health and Safety management. Companies on the one hand put a lot of emphasis on implementing mechanisms and schemata for safety, on the other, however, there are deeply rooted areas which influence negatively safety climate. [10]

For smooth functioning of any enterprise, irrespective of industry it operates in, there are many actions to be taken. Apart from operational processes for correct functioning there are required managing and support processes. Managing Health and Safety surely belongs to actions facilitating operating of a company. Until some time ago, financial resources spent on ensuring safety in a workplace were treated as costs not investments. Only calculations regarding accident costs (e.g. damages) have convinced companies (uniformed services) to treat the funds spend on safety as investments. [11]

It is worth noticing that the actions connected with increasing the level of safety culture belong to low cost actions. Such actions, however, will not bring results immediately, they are spread over a long period of time and they require continuous and constant work.

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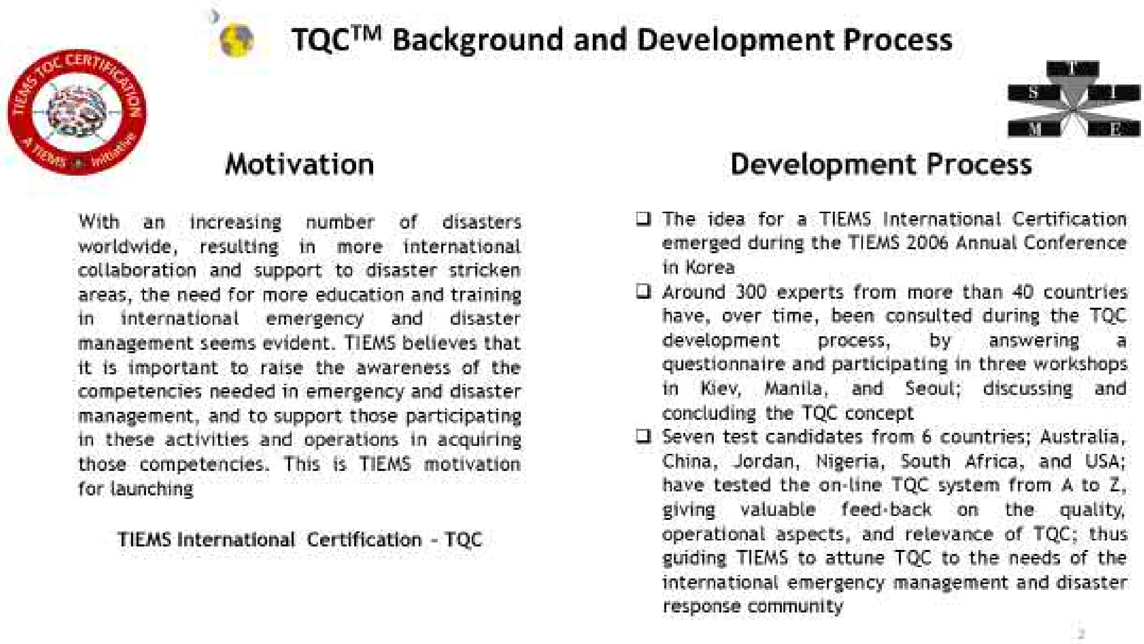
A Brief Introduction to
TIEMS International Certification - TQC™
TQC stands for TIEMS Qualification Certification
"in International Emergency and Disaster Management"
or only TQC
By TQC team: K. Harald Drager, Thomas V. Robertson, Snjezana Knezic, and Sandro Bologna (with additional collaborators that are added on an ongoing basis, roman.tandlich@gmail.com).
https://www.tiems.info/index.php/education/overview


TQC™ Background and Development Process
Motivation
With an increasing number of disasters worldwide, resulting in more international collaboration and support to disaster stricken areas, the need for more education and training in international emergency and disaster management seems evident. TIEMS believes that it is important to raise the awareness of the competencies needed in emergency and disaster management, and to support those participating in these activities and operations in acquiring those competencies. This is TIEMS motivation for launching
TIEMS International Certification - TQC
Development Process
The idea for a TIEMS International Certification emerged during the TIEMS 2006 Annual Conference in Korea
Around 300 experts from more than 40 countries have, over time, been consulted during the TQC development process, by answering a questionnaire and participating in three workshops in Kiev, Manila, and Seoul; discussing and concluding the TQC concept
Seven test candidates from 6 countries; Australia, China, Jordan, Nigeria, South Africa, and USA; have tested the on-line TQC system from A to Z, giving valuable feed-back on the quality, operational aspects, and relevance of TQC; thus guiding TIEMS to attune TQC to the needs of the international emergency management and disaster response community

TIEMS International Certification - TQC™

TQC For Whom:

- TQC is a certification for individual emergency managers with a nationally recognized professional certification or other individuals with documented competence and experience, practical or academic, in international emergency and disaster management
- TQC only certifies knowledge and competences about international standards, requirements, and best practices, necessary to create "an international common understanding" among those working with emergency and disaster management internationally

TQC Objective:

TIEMS Believes that an Internationally Focused Certification will:

- Promote Global Competence in Emergency Management
- Share Best Practices
- Support International Collaboration
- Lead to an International Common language, Knowledge and Understanding of Emergency and Disaster Management

https://www.tiems.info/index.php/education/overview

3

TQC™ Process

TQC can act as the facilitator element in the cooperation's efforts between countries and organizations using a common language and a common knowledge and understanding of international emergency management and disaster response

4

TQC™ Certification Prerequisites

To be eligible to take the TQC exam, a candidate should provide evidence of *Education, Participation, Contribution, and Competence*

The Applicant is encouraged to identify international aspects in any of the below!

Education – *One or more of the following:*

i. Bachelor's degree in science, engineering, social science or emergency/disaster management specialty (International Standard Classification of Education Level 6, e.g., a bachelor's degree from a reputable university)

ii. Minimum 50 hours of emergency/disaster management training in the last 5 years

iii. A certification related to emergency/disaster management at the national level

Participation –

The candidate is required to have at least 3 years' experience as a first responder, volunteer, educator, leader, or other activity, practical or academic, directly involved with emergency/disaster management, in the last 6 years.

Contribution – *one or more of the following*

i. At least 5 publications or speaking engagements in emergency/disaster management

ii. Participation as leader or board member of an organization that participates in emergency/disaster management

iii. Teaching emergency/disaster management

Competence –

The candidate is required to show having competence (experience or education) in seven areas of emergency and disaster management:

i. International Perspectives
ii. Preparedness, Prevention, and Mitigation
iii. Predictions and Early Warning
iv. Emergency Operations
v. Public Warning
vi. Search and Rescue
vii. Recovery and Reconstruction

TQC Code of Conduct

Read and follow the TQC Code of Conduct during the TQC Certification Process

5

TQC™ Application Form

Welcome to the TIEMS International Certification - TQC.

Please familiarize yourself with the process and requirements of the TQC Certification by reading the following documents and check off that you have read and understood them, and that you think you meet the requirement criteria for TQC Certification and will respect the TQC Code of Conduct.

Once you are comfortable that you meet the required criteria, simply fill out below to alert us of your interest in pursuing certification.

Please be aware that **ALL fields except "State" are required**. Failure to provide a complete application may result in a summary rejection of your application.

TQC Brief Introduction	☐ I have read and understood the introduction
TQC Code of Conduct	☐ I have read and understood the Code of Conduct
Are you a Member of TIEMS	No
If YES, please enter your membership code	Membership ID

-------- *and more as listed to the right*

- ❑ Demographic and Contact information,
- ❑ Education Background,
- ❑ Nature of Present Work
- ❑ Specializations,
- ❑ Experience in Emergency Management during the past 20 years,
- ❑ EM Interests,
- ❑ English Language Capability,
- ❑ Motivation for Certification

Start your TQC Certification by filling out the [TQC Application Form]

6

TQC™ Candidate Evaluation

The Applicant's TQC Process and Performance is Evaluated, Monitored and Approved by 3 TQC Boards

7

TQC™ Required Documentation

- ❑ A Curriculum Vitae (CV), showing the candidate's educational and professional experience
  The CV should cover:
  - a) Address and contact information
  - b) Work experience
  - c) Education and training
  - d) Language skills
  - e) Other information the candidate wishes to include
- ❑ Copies of Degree Diplomas, Program Certificates, and Course Completions
- ❑ Copies of Certifications Related to Emergency and Disaster Management
- ❑ Evidence of Publications, Presentations, Teaching, or Leadership
- ❑ A professional reference describing the candidate's participation in emergency/disaster management activities
- ❑ Additional Background and Experience Documentation
- ❑ A Competence Area Summary, Demonstrating Knowledge in the Following 7 Competence Areas:
  - a) International Perspectives
  - b) Preparedness, Prevention, and Mitigation
  - c) Predictions and Early Warning
  - d) Emergency Operations
  - e) Public Warning
  - f) Search and Rescue
  - g) Recovery and Reconstruction

8

TQC™ Concept and Framework

TQC Web- Platform on Moodle

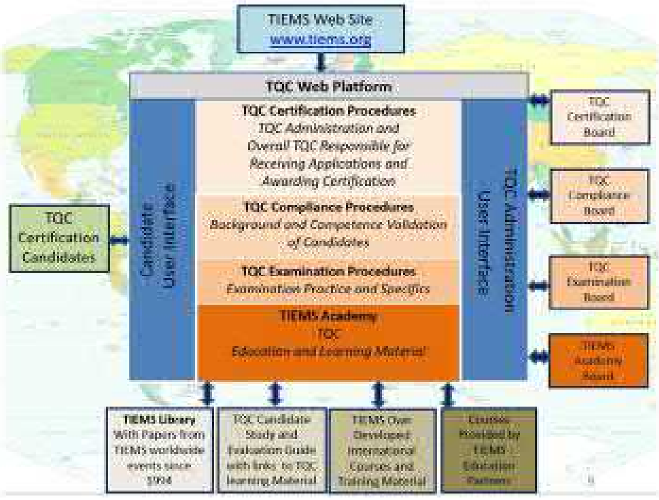
TQC PROCEDURES FRAMEWORK

PUBLIC DOCUMENTS

- ❑ TQC Brief Introduction
- ❑ TQC Description
- ❑ TQC Code of Conduct
- ❑ TQC Application Form

TQC ACCEPTED CANDIDATES ONLY

- ❑ TQC Candidate Certification Guide
- ❑ TQC Examination Guide
- ❑ TQC Examination Questions
- ❑ TQC ProctorFree User Guide



TQC™ Platform with TIEMS Academy and Present Courses

TIEMS Academy

The overall goal is that TIEMS Academy shall be an online portal that will make emergency management educational resources, from TIEMS and reputable educational institutions and initiatives, broadly available worldwide

TIEMS Academy Contains

- ❑ *TIEMS Educational Material, in form of Programs and Proceedings from TIEMS International Events (1994 – 2020)*
- ❑ *TIEMS own Developed Courses*
- ❑ *Courses provided by the TIEMS International Education Network*
- ❑ *Links Provided to Relevant International Teaching Material for TIEMS International Certification*

10

TQC^{TM} Curriculum & Examination

- TIEMS encourages TQC candidates to gain exposure to the many aspects that comprise the field. The TQC Web Platform with TIEMS Academy, therefore, provides references to the most important areas.
- During the TQC Compliance Process, the Candidate has to demonstrate experience or knowledge in 7 Competence Areas by a Competence Areas Summary (CAS)
- However, for the TQC examination, the focus is on 4 important areas, on which the TQC Candidate will be tested in a proctored, "closed book" examination process.

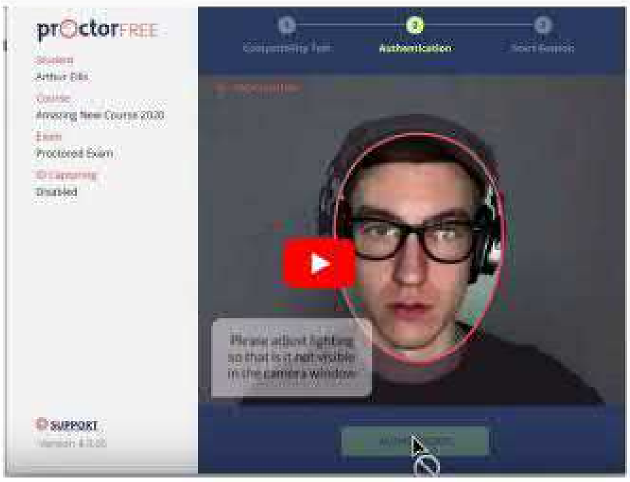
Competence Area Summary Comprises	TQC Examination Areas
International Perspectives	International Perspectives
Preparedness, Prevention, and Mitigation	Sendai Framework
Predictions and Early Warning	
Emergency Operations	ISO Standards
Public Warning	
Search and Rescue	INSARAG Framework
Recovery and Reconstruction	

11

TQC^{TM} Examination Monitoring

In order for the TQC Candidate to take the TQC Exam wherever he/she is, he/she will be identified and monitored by ProctorFree during the whole TQC exam.

- Picture Identification will be required
- Each Exam Quiz has a Time Limit.
- The candidate will have to stay at his/her computer and will not be allowed to change screens or look away or leave the computer during each Exam Quiz.



https://proctorfree.com/

12

TQC™ Sample Diploma

13

TQC™ Charter Members 2021

These TQC Charter Members are those who have fulfilled TQC Certification Requirements by passing through all phases of TQC Certification: TQC Application, TQC Compliance, and TQC Examination

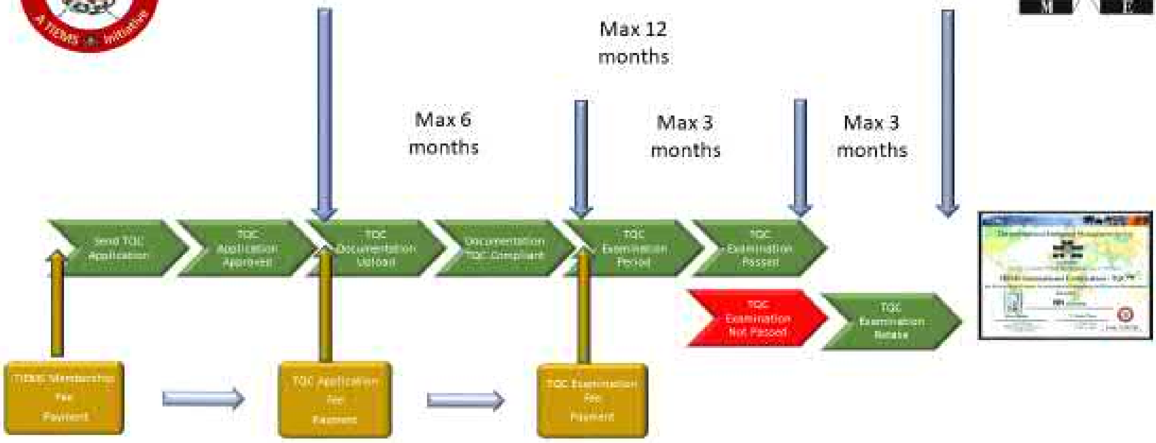
1. Desiree Beekharry (Australia)
2. Larry A. Porter (USA)
3. Gbenga Morenikeji (Nigeria)
4. Nothemba M. Mhlaba (South Africa)
5. Naill Al Momani (Jordan/Dubai)
6. Russell Dippy (Australia)
7. LiLi (China)

TQC Charter Members Diplomas

- ❑ TQC is awarded for a three-year period
- ❑ Re-certification efforts required prior to the end of the third year
- ❑ Submit the Re-Certification Form
- ❑ Evaluation of the TQC-certified person's experience, activity, and education/training during the 3 years
- ❑ Re-Certification Certificate, Or, Re-Certification Exam

14

TQC™ PAYMENT TIME AND PRACTICAL STEPS



15

TQC™ Certification Fee Elements

1. TIEMS ANNUAL MEMBERSHIP FEES

(ONE OF THE FOLLOWING TIEMS MEMBERSHIPS IS REQUIRED BEFORE SENDING THE TQC APPLICATION)

- ❑ Standard Member -- *One Year Membership*: **95 €**
- ❑ Standard Member Transition Economy Country -- *One Year Membership*: **35 €**
- ❑ Student Member -- *One Year Membership*: **25 €**
- ❑ Institutional Member -- *One Year Membership*: **310 €**
  - ➢ **Includes 5 TIEMS Memberships**
- ❑ Professional Certified Member -- *One Year Membership*: **125 €**
  - ➢ **This membership is for TQC Certified Members after their certification**

2. TQC CERTIFICATION FEES

(BOTH OF BELOW FEES IS REQUIRED DURING THE TQC CERTIFICATION PROCESS)

- ❑ TQC Application Fee: **125 €** (BEFORE STARTING THE TQC COMPLIANCE PROCESS)
- ❑ TQC Examination Fee: **100 €** (BEFORE STARTING THE TQC EXAMINATION PROCESS)

- ❑ **In TQC inaugural year 2021, TIEMS is offering 50 % discount on above TQC Certification Fees!**
- ❑ **TIEMS members from transition economy countries can apply for TIEMS TQC Scholarship, which will cover TQC Application Fee and 50 % of the TQC Examination Fee for qualified applicants**

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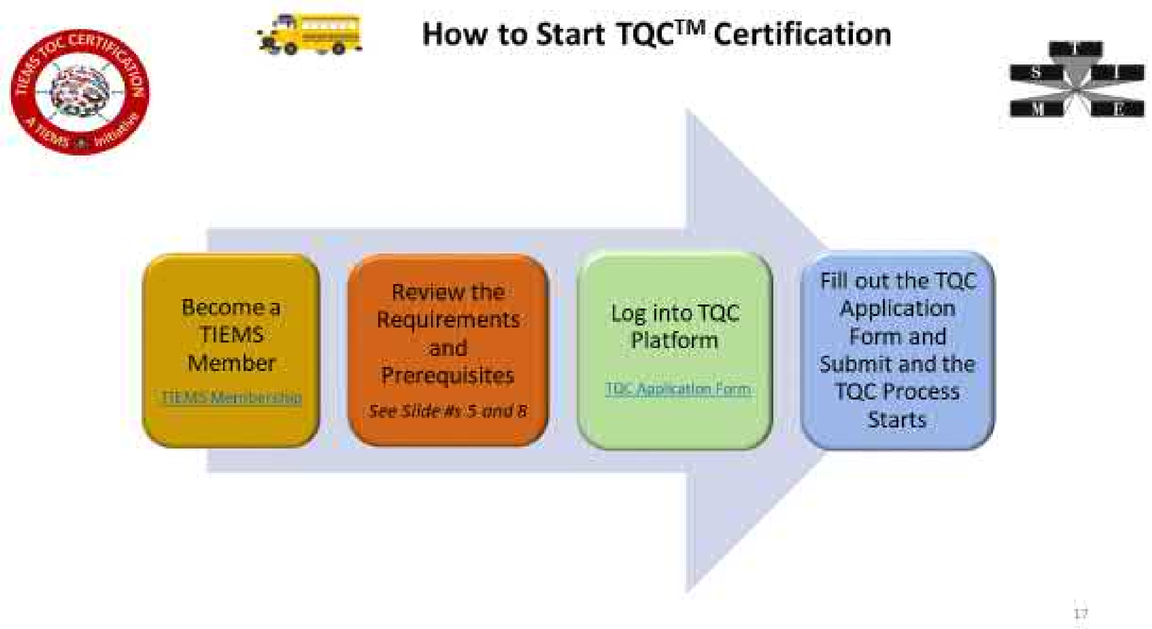
How to Start TQC™ Certification
TIEMS TQC CERTIFICATION
A TIEMS Initiative
Become a TIEMS Member
TIEMS Membership
Review the Requirements and Prerequisites
See Slide #s 5 and 8
Log into TQC Platform
TQC Application Form
Fill out the TQC Application Form and Submit and the TQC Process Starts
17


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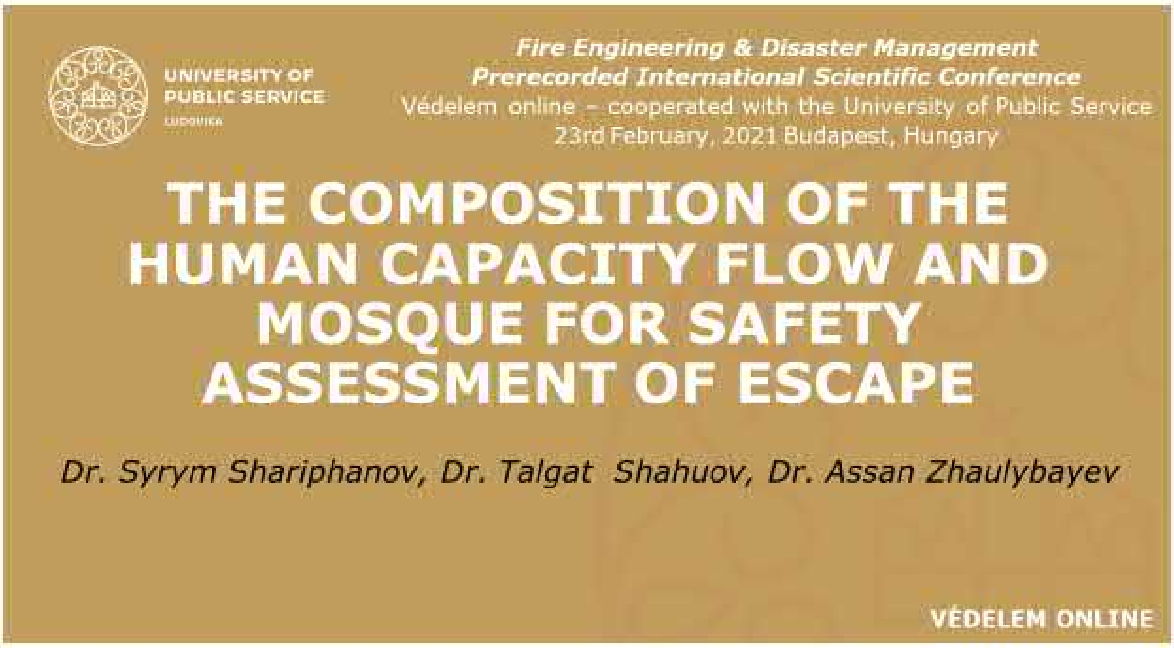
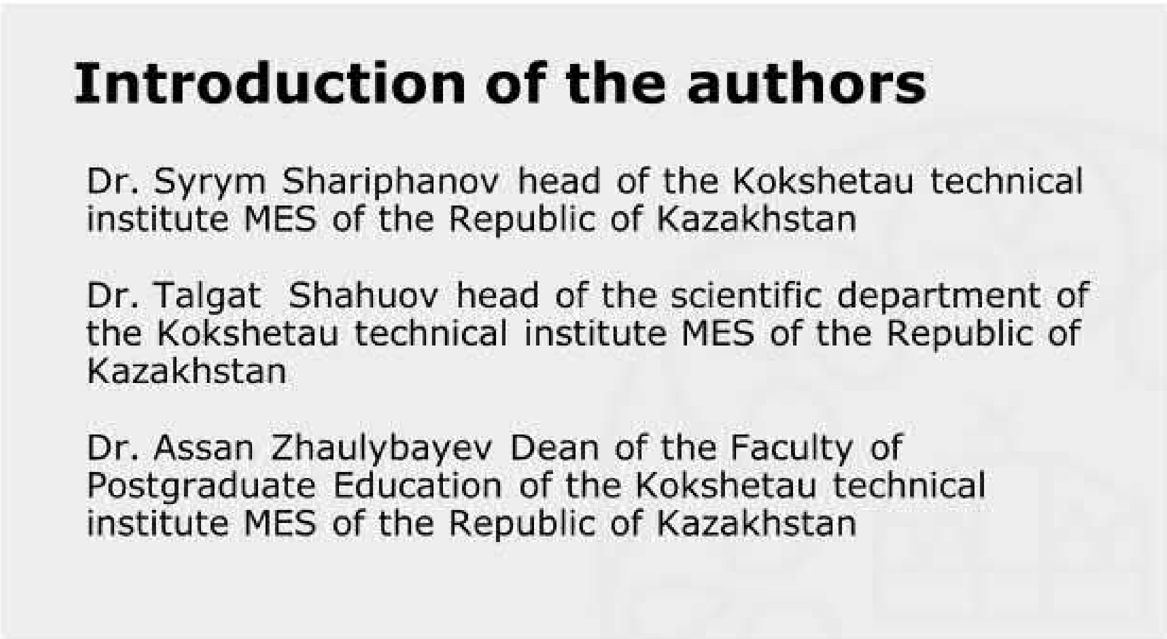
LUDOVIKA
THANK YOU FOR YOUR ATTENTION!
uni-nke.hu


UNIVERSITY OF PUBLIC SERVICE
Fire Engineering & Disaster Management
Prerecorded International Scientific Conference
Védelem online – cooperated with the University of Public Service
23rd February, 2021 Budapest, Hungary
THE COMPOSITION OF THE HUMAN CAPACITY FLOW AND MOSQUE FOR SAFETY ASSESSMENT OF ESCAPE
Dr. Syrym Shariphanov, Dr. Talgat Shahuov, Dr. Assan Zhaulybayev
VÉDELEM ONLINE


Introduction of the authors
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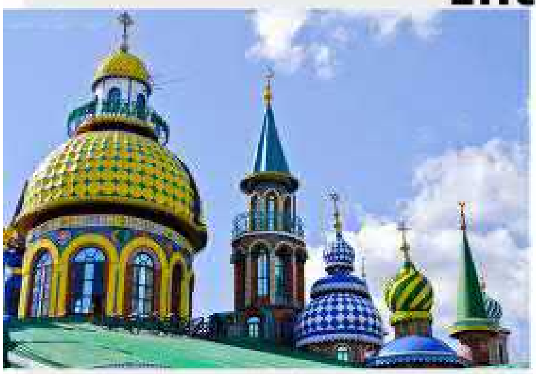
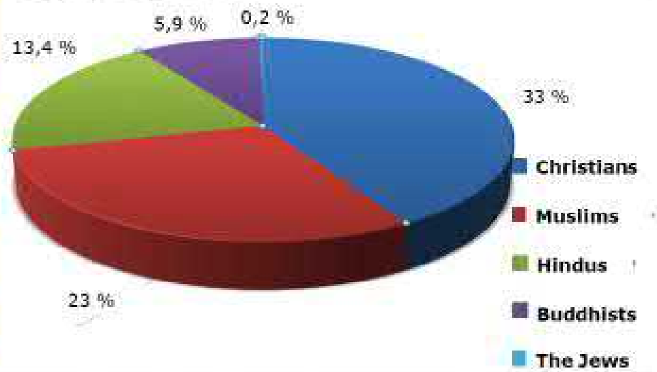
Dr. Talgat Shahuov head of the scientific department of the Kokshetau technical institute MES of the Republic of Kazakhstan
Dr. Assan Zhaulybayev Dean of the Faculty of Postgraduate Education of the Kokshetau technical institute MES of the Republic of Kazakhstan

Abstract

Problems safe evacuation of people from religious buildings poorly reflected in the rate-setting instruments. Solution of the first block of the tasks required for the analysis of safety evacuation process - defined gender and age composition of the people attending the mosque. The relationship between the area of the prayer hall and the number of people for the definition-of the estimated capacity of the mosque.

Introduction





The MOSQUE is the main religious building in Islam, where believers gather for collective worship, spiritual solitude, marriage, education and other significant social and cultural events in the life of Muslims.

Name of the mosque and geographical location	The area of the mosque, m2	Capacity of the mosque, people
Al-Haram, Saudi Arabia, Mecca	360 000	1,2 million
The Prophet's mosque, Saudi Arabia, the city of Medina	170 000	0,6 million
Shah Faisal Mosque, Pakistan, Islamabad	5 000	0,3 million

CASES OF FIRES IN MOSQUES

Fire on April 10, 2015 in Kizlyar, the central mosque of the city burned down, the total volume covered by fire is 2500 m2;

Fire on January 16, 2012 in the largest mosque in Central Asia "Hazret Sultan" in Astana

COLLECTIVE PRAYERS ON PUBLIC HOLIDAYS

SHOES ON THE ESCAPE ROUTES

5

Shoes in the lobby

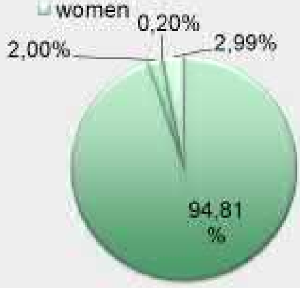
Shoes on the escape routes

Shoes on the stairs

ANALYSIS OF THE COMPOSITION AND FLOW OF HUMAN COMMUNICATION AREA AND THE NUMBER OF PEOPLE IN THE MOSQUE

percentage distribution of the people

- men of working age
- elderly men
- children with an adult escort
- women



1) The area is composed of several :

$$S_M = L_p / N_p, \quad (1)$$

S_M – square, one worshipper in a row;

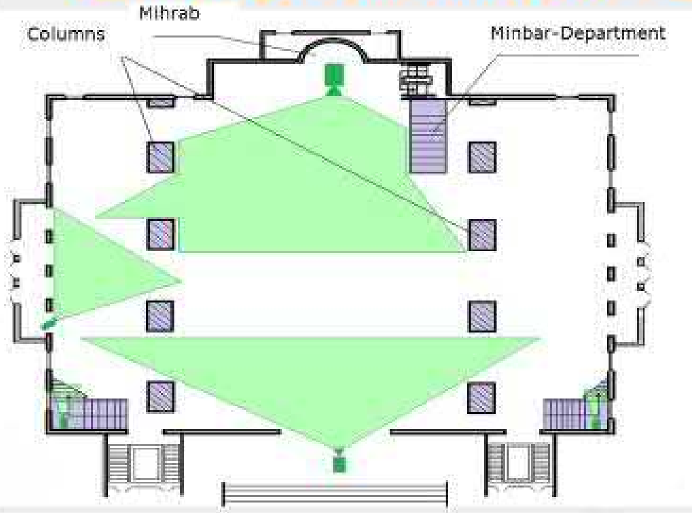
L_p – the length of the row;

N_p – number of people in a row.

2) The necessary area for the worshipper during prayer :

Number of worshippers:- prayer hall = 0.6 m2/person;- hall and staircase areas = 0.7 m2/person.

METHODS OF CONDUCTING FIELD OBSERVATIONS



- area occupied by structures and equipment;

- usable area.

Fragment of capturing a scale grid

The process of movement of people at the exit of the mosque

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Poster Section

of the Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Fire Engineering & Disaster Management
Prerecorded International Scientific Conference

Tree Seed Fibers Flammability Analysis by MCC and TGA

Jinheng Xu
College of Chemistry, Nankai University, No.94 Weijin Road, Nankai District, Tianjin, P. R. China, 300071

Abstract Poplar and plane tree are widely planted as street trees in cities. The seed fibers of both two kinds of tree pose a significant fire risk. Microscale combustion calorimetry (MCC) and thermogravimetric analysis (TGA) were used to study the flammability of two kinds of fluffy seed fibers. Both Method A and B procedures were used in MCC tests, while TGA tests were conducted in Nitrogen and Air atmospheres. The peak heat release rate is higher for method B compared to method A at a given heating rate. From Method B, the net calorific value of the specimen gases, for poplar is 16.09 kJ/g and for plane tree is 16.65 kJ/g. These values are similar to other biomass namely, rice husk and wheat straw, which have high level of fire risk.

Introduction

Poplars are rapid-growing but relatively short-lived trees. Plane tree, one of the 10 species of the genus Platanus, is the only genus of the family Platanaceae. These large trees are native of North America, eastern Europe, and Asia. Plane tree mainly in south China and poplar mainly in north China, and are widely planted as street trees in the city. During April to May, the tiny hair of plane's bristly seed balls and silky hair of Poplar's fruit fly in the surrounding environment aided by wind, which not only not only creates respiratory track discomfort in humans but also pose a significant fire risk. Therefore, to potentially curd their contributory factor towards fire events, it is imperative to comprehend their burning behavior.

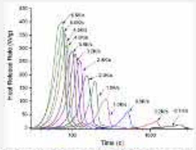
Methods

Microscale combustion calorimetry (MCC) and TGA were used to study the flammability of these two kinds of seed fibers. MCC mainly obtains the heat release rate, while TGA illustrates the thermal stability of the fibers. Microscale combustion calorimetry (MCC) has been developed by FAA, USA. There two types of methods in MCC, Method A and B, in Method A, sample pyrolysis in nitrogen, while in Method B, sample pyrolysis in air atmosphere, then released gas is oxidized in a 900 degree combustor, the rate of heat release is calculated by means of oxygen consumption. MCC Test procedure was according to the ASTM standard D7309-13. In the tests, 13 heating rates, 0.1, 0.2, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, and 3.5, 4.0, 4.5, 5.0, and 5.5 K/s. TGA tests were carried out in nitrogen and air atmospheres with the heating rates of 0.5, 1.0, 1.5, 2.0 K/s.

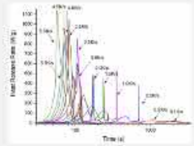
MCC

TGA

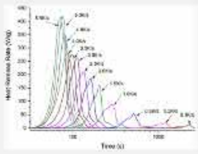
Result and Discussion



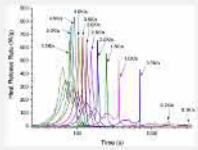
HRR of Poplar_Method A



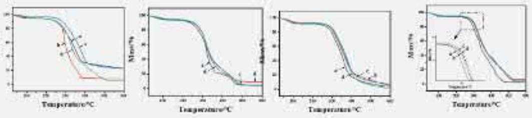
HRR of Poplar_Method B



HRR of Plane_ Method A



HRR of Plane_Method B



Mass Loss Rate

The results of TGA are the same as those HR R of MCC. There is only one significant stage of fiber pyrolysis in nitrogen atmosphere, but there are several distinct stages in air atmosphere. Correlation analysis shows high mass loss rate leading to high heat release rate in nitrogen atmosphere and in Method A, while in air atmosphere and Method B, the fiber pyrolysis along with reaction with the oxygen in air, resulting multipeak and low correlations between mass loss rate and HRR.

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NANKAI UNIVERSITY
COLLEGE OF CHEMISTRY

VÉDELEM ONLINE

Fire Engineering & Disaster Management
Prerecorded International Scientific Conference

Fire Safety In Building Construction

Col. János Gyapjas, Lt. Regina Haris
Disaster Management Directorate for Bács-Kiskun County

Abstract

'The following presentation supports our claim that the representation of fire safety in the building construction is not optimal. The aim of our scientific research was to find typical insufficiencies by the method of focus group interviews and questionnaire. Twelve typical constructional insufficiencies were identified, whereof six stands out by occurrence.
Fire safety professionals are rarely involved in the process of construction and obtaining occupancy permit. Constructional insufficiency in non-licensed building construction is also a common occurrence. Based on the results in this study we propose the optimalization of constructional fire safety. [1]-[3]

Introduction

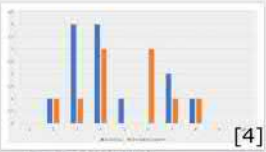
Fire safety is a priority in terms of protection of life, value and production continuity. Our assumption is that fire safety is underrepresented in building construction.

Methods

Focus group interview and questionnaire were chosen as a method of research. The respondents were the fire safety officers of the Disaster Management Directorate for Bács-Kiskun County and local experts of fire safety engineering.

Results

The state of fire safety in building construction was rated worse than five on a ten-point scale. Twelve typical issues were identified, of which six stand out.

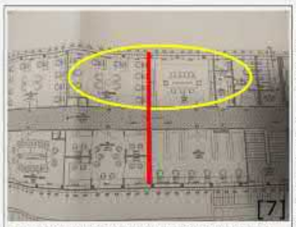

[4]

Inadequate documentation
Minimal requirement design
Lack of competence of the constructor
Ignorance of the fire prevention clause of the building permit
Lack or fault of firestopping
Semi-finished building

Common causes [5]

Lack of firestop in a corrugated metal sheet [6]

Insufficiencies are identified in the vast majority of occupancy permit inspections. Fire safety specialists are rarely involved in the preparation of inspections and support of construction. Solving problems prior to the inspections is faster and simpler due to time factor. Solutions for fire safety related constructional problems are commonly complicated and expensive in comparison with the volume of the investment. Dividing fire safety into ten subcategories, insufficiencies of construction of firestops and fire barriers (including sealings, stops and dampers) and special structures were mentioned.
The lack of fire safety competencies of the quantity surveyors, technical managers and construction supervisors are considered as the cause of constructional problems by the focus group. Fire safety experts are rarely involved in the preparation and the support of the aforementioned professionals (there is no such entitlement in the fire safety field).


[7]
The continuity of the boundary of fire compartment was damaged (gypsum wall between offices) highlighted by red. It was a non-licensed renovation.

Fire safety related constructional insufficiencies are experienced during renovation and reconstruction related to operational demands. Non-licensed reconstruction faults were considered the common as well by the interviewed experts.

Conclusions

Based on the results of this study the representation of fire safety is not optimal in building construction. We have identified several common causes and insufficiencies.
The results justify to examine the issue more broadly and to continue the research further.
We propose:

- to use the experience in training of fire prevention officers and fire safety engineers
- review the system of requirements of qualifications and entitlements, regulations of the Chamber of Engineers and the Chamber of Architects, furthermore the general regulations of the field and the internal regulations of the authority

References:

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Link:
http://njt.hu/cgi_bin/njt_doc.cgi?docid=26565.417169
[4]-[7] Pictures and infograms owned by the authors

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Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Examination of the transport of high consequence flammable dangerous goods

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E-mail: zsofiaraffai@gmail.com

Maj. Hermina Horváth *assistant lecturer;* Department of Industrial Safety UPS
E-mail: horvath.hermina@uni-nke.hu

Abstract

The purpose of the poster was to give a short professional presentation of the transport of high consequence flammable dangerous goods. Being aware of security planning and dangerous goods with a high risk to security is not only important for those who work with dangerous goods on a daily basis, but it is also an essential topic for those who live near facilities with such activities, routes or rest areas. In order to protect the inhabitants' lives and the environment, the prevention of accidents during the shipping of dangerous goods is necessary, together with the quick and professional elimination of a possible occurrence.

Introduction

Hungary's geographical location is extremely favorable, so a significant amount of dangerous goods is transported on the country's roads. [1] The transport of dangerous goods, is receiving increasing especially the high consequences dangerous goods, which is not surprising given the growing risk of terrorist acts in our world, so reducing the potential for misuse of these substances is a priority. Accidents involving such substances not only have a danger to the victims but also have a serious risk to the environment due to the nature of the material transported.

High consequence dangerous goods

A four-digit UN number, accompanied by a safety data sheet, is essential to identify hazardous substances. The safety data sheet must always be completed if you want to transport or store dangerous goods. High consequence dangerous goods are those which have the potential for misuse in a terrorist event and which may, as a result, produce serious consequences such as mass casualties, mass destruction or, mass socio-economic disruption.

Flammable and explosive substances

Flammable and explosive substances directly endanger people's lives and property. Where material with this property is present, there is a constant risk of fire. It is important that any hazardous substance that is of unknown, unclear origin, or clearly unidentifiable is classified as highly toxic and flammable and explosive until identified by a qualified professional. The next table present some high consequence flammable dangerous goods.[2]

CLASS	SUBSTANCE OR ARTICLE	QUANTITY		
		Tank(l)	Bulk (kg)	Package (kg)
2	Flammable, non-toxic gases (classification codes inclu - ding only letters F(flammable) or FC (flammable and corosive)	3000	Not relevant	unlimited
3	Flammable liquids of packing groups I and II	3000	Not relevant	unlimited

Table 1. high consequence flammable dangerous goods [3]

Security plan

Companies and plants involved in the transport of dangerous goods with a high consequence to public safety must need a security plan. The security plan is prepared by the security consultant, based on the general situation of the company, which reflects the activities of the company. The security plans shall highlight the description of the location of the site, the location of the storage facilities for hazardous substances and the measures taken to ensure safety.

Conclusion

Nowadays, the transport of dangerous goods, especially goods with special properties (flammable), is a serious challenge. The transport of this kind of goods requires a serious planning system and supervision. In addition to today's attacks, it is worth paying much more attention to such materials and preparing for everything.

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Fire Engineering & Disaster Management Prerecorded International Scientific Conference

The role of ÉMI LLC. in Hungarian fire protection

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Abstract

The diverse activities of ÉMI Nonprofit LLC. are related to the Hungarian Disaster Management in many respects, especially to the field of fire protection.
ÉMI Nonprofit LLC. is currently the largest organization in Hungary dealing with the conformity assessment and testing of construction products. The test reports, technical assessments, certificates and specialist resolutions issued by it are the accepted basic documents of fire protection planning.
ÉMI also contributes to the preparation of Hungarian fire protection technical guidelines and fire protection legislation and standards. It shares its international experience in publications.

Introduction

In addition to the state and central fire protection organizations, the ÉMI LLC. plays an important role in the Hungarian professional life.

Methods

Analysing activities and tasks of ÉMI LLC. in the field of fire protection.

Results

The ÉMI Conformity Assessment Center performs the technical assessment and certification activities necessary for the distribution and installation of construction products. As part of this, it issues national and European technical assessments for products not covered by the harmonized product standard, and - as an accredited certification body - issues certificates of constancy of performance and factory production control on the basis of harmonized product standards and specific technical specifications. Most of the time, they also include fire protection features. This activity of ÉMI covers almost the entire vertical of construction products.
During the certification procedures, ÉMI inspects, certifies and regularly reviews the production plants of the construction products and the production control system of the manufacturer. Usually it is a priority to check the constancy of the fire protection characteristics.

Figure 1: Fire resistance test of a light-weight roof structure (P. Tóth)

Testing activities

The Fire Protection Testing Laboratory of ÉMI is suitable for performing most material and structure tests in the European system, and it also has active fire protection testing possibilities.
A horizontal and vertical furnace is available for structural tests. Facade fire propagation tests are performed according to a Hungarian national standard. Test and classification reports are issued for the tests performed.

Research activities

Since its establishment, ÉMI has undergone an outstanding development in the field of R&D, innovation and international activities. In addition to its domestic, Hungarian market-oriented research and development activities, it participates in international R&D tenders, which are often aimed at developing or defining fire protection characteristics.
The Company is a member of many European and international organizations such as EOTA, Egolf, ENBRI, WFTAO, CIB, ECTP or UEAtc.

Discussion

The diversity of its activities offers many opportunities for ÉMI to support the domestic fire protection.

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Fire Engineering & Disaster Management
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Basics of the fire protection of alternative energy sources

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Abstract

We make our lives easier with various technical possibilities and machines. They are traditionally powered by electricity from transmission lines or by conventional diesel and petrol fuels. The different energy sources also pose tasks and challenges in the field of fire protection.

A review of the basic, related knowledge is now done to see what these alternative directions are and what their characteristics are. What additional issues do each non-traditional energy source raise in the field of fire safety.

Introduction

There are several ways to meet the general energy needs of industry and households, depending on the installation, operational situation and needs, or for the targeted use of green, renewable energy sources. Traditionally available options are provided by electricity from transmission lines or general diesel and gasoline fuels. In relation to these, I consider the available and applied alternative energy sources that have similar or different properties and needs in the field of fire protection. Such alternative energy sources in the renewable area could be solar energy, wind – water energy, or geothermal energy. In the case of non-renewable energy sources and in this research area, it may be interesting to look at non-conventional, less polluting but efficient forms such as natural gas. [1] [2]

Methods

For this poster the elements of the traditional and the alternative energy sources analysed by scientific and fire professional publications. [3] [4]

Traditional ways for energy:

Alternative, renewable energy sources:

Alternative, non-renewable energy sources:

Results

The fire protection issues in this research area not wide so as the using of the alternative energy sources are raising, the fire protection issues (prevention and intervention) must follow this process. The new, only some decades old technologies gives for the fire prevention and intervention experts new challenges. How we can protect the industrial technologies or the homes from the fire dangers by these new energy sources? How can intervene the fire units, what methods helps in the different, not ordinary circumstances to supress the fire or for technical rescues. [5] [6] [7]

Discussion

The experts in the fire field must analyse the low number fire events (because the low level using of alternative energy sources) and make experiments to find the best solutions for the present and close future[8].

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Examination of ATEX rule changes in Hungary

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****Associate professor, University of Public Service**

Leak detector recognises ultrasound 'fingerprints'

Abstract

Today, there are a number of legal requirements in the field of the protection of explosion. Of these requirements, a significant is the 99/92/EC (also known as 'ATEX 137' or the 'ATEX Workplace Directive') on minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres [1]. The text of the Directive and the supporting EU produced guidelines are available on the EU-website. Directive 94/9/EC (also known as 'ATEX 95' or 'the ATEX Equipment Directive') on the approximation of the laws of Members States concerning equipment and protective systems intended for use in potentially explosive atmospheres. The text of the Directive and EU produced supporting guidelines are available on the EU website [2].

Selection of equipment and protective systems

Areas classified into zones must be protected from sources of ignition. Equipment and protective systems intended to be used in zoned areas should be selected to meet the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996. Equipment already in use before July 2003 can continue to be used indefinitely provided a risk assessment shows it is safe to do so [3].

Identifying areas where explosive atmospheres may occur

Where necessary, the entry points to areas classified into zones must be marked with a specified 'EX' sign·

Providing anti-static clothing

Employers must provide workers who work in zoned areas with appropriate clothing that does not create the risk of an electrostatic discharge igniting the explosive atmosphere, e.g anti-static footwear. The clothing provided depends on the level of risk identified in the risk assessment [5] [6].

Equipment and protective systems intended for use in explosive atmospheres

The aim of Directive 94/9/EC is to allow the free trade of 'ATEX' equipment and protective systems within the EU by removing the need for separate testing and documentation for each Member State.
The Regulations apply to all equipment intended for use in explosive atmospheres, whether electrical or mechanical, and also to protective systems.
Manufacturers/suppliers (or importers, if the manufacturers are outside the EU) must ensure that their products meet essential health and safety requirements and undergo appropriate conformity procedures. This usually involves testing and certification by a 'third-party' certification body (known as a Notified Body) but manufacturers/suppliers can 'self-certify' equipment intended to be used in less hazardous explosive atmospheres. Once certified, the equipment is marked by the 'EX' symbol to identify it as such.
Certification ensures that the equipment or protective system is fit for its intended purpose and that adequate information is supplied with it to ensure that it can be used safely [4].

Explosion-protected LED safety torches and chargers

References

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Hospital evacuation

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Dr. Lajos KÁTAI-URBÁN - UPS

Fotó: Kovács Attila – Semmelweis Egyetem

Abstract

The purpose of this study is to illustrate the special cases of a fire in a hospital, that may be encountered by the fire-fighters. Due to these special circumstances, the evacuation time of the facility can be significantly increased. There are unusual evacuation and rescue methods, which requires special devices and more intense human resources. The evacuation of a hospital is more than the usual evacuation plan, the goal is to maintain the health care services during and after the evacuation. This requires much more accurate and complex training from both sides, either the fire-fighters and the medical staff. Also its effectiveness depends on a large extent of the architectural and fire protection design of the building, its modernity, the available medical and rescue equipments and the number of medical staff.

Evacuate who?

The hospital evacuation is an unusual task. There are healthcare workers, other employees, but mostly patients and occasionally their relatives.

Most of patients can't move this way and with this speed, with which we planned the evacuation calculations. That is especially true by the Intensive Care Units (ICU), and the Perinatal/Neonatal Intensive Centers (PIC/NIC)

Evacuate how?

Fotó: Kovács Attila – Semmelweis Egyetem

- Evacuation
  - Vertical/Horizontal
  - Partial
  - Complete
- Shelter-in-place

The usual evacuation strategies are the same in a hospital too. Which strategy we plan to follow or apply multiple strategies at once depends on several factors:

- Existence and number of vertical/horizontal fire compartmentation in the building;
- Existence of evacuation elevators;
- The general condition of the patients per departments/fire compartmentation;
- Existence of a secure fire compartmentation with redundant medical gas- and electric network.

Shelter-in-place

- Maintain the patient care within facility;
- May be the fastest method;
- It is time limit which depends on the building's construction, the fire compartmentiaton's construction, the availability of the redundant networks and the interventional abilities of the fire brigades.

Disaster medicine

Disaster medicine provides care for the victims of natural and man-made disasters with specific consideration given to timeliness and availability of resources.

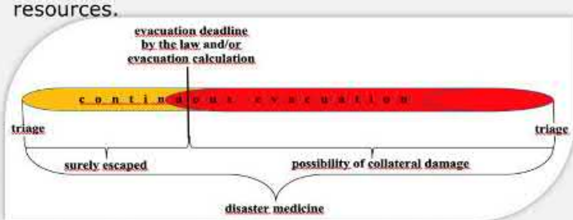

Figure 1 - Disaster medicine in the evacuation process – István Mészáros, 2021

The disaster medicine is there in the whole process, because there is much more task compared to available deadline, and avilable resources (facility and HR too). It's necessary to do triage at the start, to rank the patients and to use unusual evacuation methods.

M.Femino, S. Young, V. C. Smith - Hospital-Based Emergency Preparedness

Fotó: Kovács Attila – Semmelweis Egyetem

How we can control the problem:

- To plan with the stakeholders
- To plan base of exercices
- To train in small groups
- To practice together the medicals and fire fighters
- To build redundant networks and fire compartmentations per medical departments (especially ICU, PIS/NIC)

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Shortcomings in cooperation during the marching of the fire engine

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Abstract

The march to the intervention area takes from the place of departure of the alarmed fire forces and equipment until the arrival of the event specified in the signal. The march is carried out using the distinctive light and sound signal at the same time, within the framework of the highway code [1]. However, fast and efficient marching is influenced by a number of factors, including the behaviour of the drivers in the traffic when a vehicle with a distinctive sign appears. In the poster, the authors present general errors and their possible solutions, referring primarily to his own driving experience. As a result of the poster, we will learn about the difficulties of the migration logistics, and the authors will present their suggestions to help the migration of the fire engine.

The problem of approaching the intervention area

The approach of the intervention area is one of the most common problems in case of the migration. This is typical on the one hand in areas far from residential area (e.g. forest) [2] and on the other hand in densely populated downtown parts of big cities. In the latter case, it is common that we cannot drive into the narrow streets with a large fire engine. Cars parked on the street make it difficult for the fire engine to march and turn, but they also make the effective intervention more difficult.

Authors suggestions

When we hear the sound of the alarm [5], it is important to consider the situation first and not act instinctively. it helps the migration, when the drivers create a safety lane, which is formed by the proper positioning of the cars. On a two-lane road, cars should be located inwards in the inner lane and outwards in the outer lane. For the safe and effective migration, we make the following suggestions:

- Describe placement practices on popular websites [6].
- Making public information booklets.
- Review of the parking situation

Obstructions in the traffic

An additional problem in case of marching of the fire engine is the behaviour of the drivers when they see a vehicle with distinctive sign. Based on my driving experiences, the behaviour of drivers is different. Some drivers are effective and they can help the march, but others do not know what to do with the situation when they see a fire truck. Many people panic, block, or try to act instinctively, which is not the best. The most common example of it is when a car is not passing through a forbidden sign while standing at a red light, thus helping the fire engine to march, but they remain standing and obstructing the fire truck. Another dangerous maneuver is when the drivers want to give priority with a quick stop, but they do it with a sudden brake just in front of the fire truck. At heavy traffic, many drivers go to the bus lane, which is normal in this case, but in this way the bus lane is not converted into a safety lane. So the ability to make quick decisions plays a big role [3] [4].

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Technical development opportunity in the field of practical training in rescue fire protection

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Abstract

With the horizontal and vertical expansion of urbanization, threats, disasters and damage of civilizational and/or natural origin are having an unprecedented impact. Due to their course and intensity, the danger to human life and material goods, it is necessary to develop certain segments of the applied protection systems, such as fire practical education, in parallel with the development of technologies. This direction of development cannot be limited to domestic research and development, it is necessary in a broader sense to examine the good practices that have already been proven and applied internationally and the possibilities of their adaptation. New educational methods and tools can make fire protection and incident intervention more effective.

Introduction

Professional and voluntary units intervening in fire protection must have a high level of competence in order to professionally deal with incidents. In many cases, they have to cope with extreme situations in duty life other than the working conditions known to civilians. In order to acquire professional practical knowledge, practice-oriented preparation is required, the development of which we propose. [1]

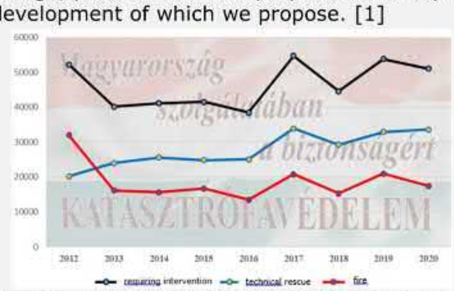

Figure 1. Interventions by the Hungarian fire and disaster management forces (Kersák 2020)

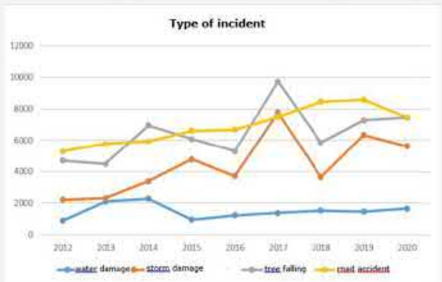

Figure 2. Type of incidents in the last years in Hungary (Kersák 2020)

The above diagrams show the fire brigade interventions in the examined period based on the types of events. It can be read that the technical rescues show an increasing trend, and it can be seen that storm damage and tree falls show a large number of cases, so the development of the field should be a priority. [2] [5]

Methods

The Hungarian disaster management databases, the international literature were analysed and consultations made with German experts for their practises in this field's training.

Results

As a development opportunity for the training area, it can be stated that firefighters regularly use chainsaws during storm damage and tree felling.

A structure can be created to simulate the tension in damaged trees, with which practical training can be developed in professional and voluntary fire organizations. [4]

Figure 3. Structures to simulate the tension in trees *(Kersák 2019)*

Discussion

The authors propose the physical implementation of the structure, taking into account the Hungarian peculiarities, and its test before applying the completed structure.

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Development of Operation Control at Hungarian Disaster Management

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Tamás Igaz-Danszky, Capital Directorate for Disaster Management, Operation Control Service

1. Abstract

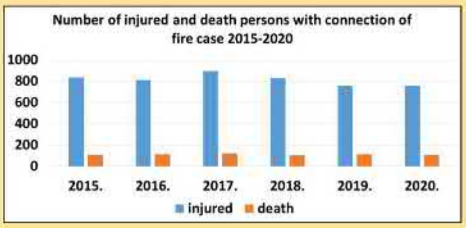
When you are terrified because of danger you want help immediately. **Capable hands** that you can trust because of their **numbers, knowledge, and tools**. It is the responsibility of the Disaster Management **Operations Control Service** to organise and direct this help. But as technology advances and new improved tools become available, we have the opportunity to **accelerate, clarify and revise the working** of this important service. Examining national and international models of operation control open possibilities to integrate new protocols into our system and by that get you the help faster and more efficiently when it is needed as part of the "In the service of Hungary for security" principle.

2. Introduction

There are numerous **research** on the different **ways and techniques of firefighting**. Only a few of them covers the first part of the process - **from the signal of danger to the arrival** of the firefighter units at the site, as well as the subsequent background activity. This is the area of the operation that I aim to examine and improve by my research.

3. Aim of the research

Finding **new models and protocols** that are based on evidence - the examination (questioners, interviews) of national and international operation control services – that can make our system more efficient and by that **saving more lives** and **preventing more injuries**.



4. Method

Once relevant data is collected (interviews, questionnaires) with a **comparative analysis**, I will be able to **determine the elements** and **specifications** of other operation control functions that can be used to improve our own system. Also designing a **complementary „home-office"** type operation control strategy, that is adaptable to our current system (not simply hypothetical) and has to be in alignment with current **legislation**.

5. Expected results

To present a **comprehensive overview** of the **current state** of the operations control service. Recommendations for the **acquisition of new tools, programs and procedures**, that are already proven by the use of other national and foreign operations control services. Proposal for an **alternative operating system** ("home-office" type work) to reinforce or replace the usual operation control service in extreme circumstances. All these findings aim to **indirectly increase the security of the population**.

6. References:

The pictures are the author owns. The source of the data is: BM OKF.

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Fire, multi-risk and technical rescue needs in Germany and Hungary. Organisational differences and similarities.

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Abstract

The objective of this study is to make a comparison on how Germany and Hungary can provide answers for the challenges of different fire and technical rescue incidents. Major improvements in technical fire fighting material but also training have been achieved for daily emergencies from the late 1970s to the today[1,2]. However, new challenges also arise, such as shift in hazard types due to technological and societal change, but also a new focus on natural hazards, multiple, sometimes cascading, risks.

Introduction

New situations have emerged, such as fires due to electric cars and batteries or increasing natural hazard events such as flash floods or vegetation fires. Another challenge is demographic and societal change; it has become more difficult to maintain the huge numbers of volunteers[1]. And due to the wide usage of smartphones, there is an increased expectation from the public on instant information dissemination over social media[2].

Methods

Analysing the organisation structures and forms in both countries will be conducted using an online scoping survey on first responders and expanded on virtual and real expert meetings and interviews.

Results

Germany sees organisational challenges in recruitment, new wildfires, e-mobility and social media demands

In Hungary the tasks as firefighting, technical rescues and disaster management are covered by the state. Basicly the government responsible for it by the National Directorate General for Disaster Management with its mainly professional fire units.

The rate of professional and volunteer fire forces is totally different like in Germany.

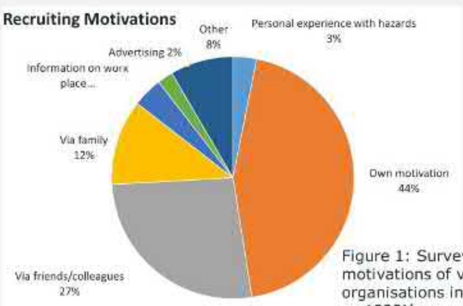

Figure 1: Survey results in Germany on motivations of volunteers to join civil protection organisations in 2017 (multiple choices possible, n=1333)[1]

Increasing dependency on electricity and other critical infrastructure is another concern. Modern fire trucks with ladders, fire station gates, communication etc. are all dependent on electricity. Electric mobility, smartphones, drones and smart grids provide many important advantages. But this development have to be seconded with increased awareness about cascading effects and multiple risks[3].

Discussion

Analysing the challenges and improvements in both countries can provide additional insights in how each country tackles them. This can help emergency organisations in different countries to better prepare for both new or changing hazard types as well as organisational transformations.[4]

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Extra load and limitations by the PPE's on the members of the Fire Protection

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Abstract

There are a lot of safety issues during the fire, disaster management tasks and interventions, mainly lifesaving, firefighting or technical rescue. Basicly personally, very close to the firefighters we can find more dangers to them. More dangers, extra loads and also limitations can caused by the personal protective equipment itself. A research described the elements, directions and also the effects these negative impacts for the protected members of fire protection or disaster management units, to varying degrees.

Introduction

Interventions of firefighters. All over the world very important the urgent start to the scene. In Hungary, after the alarm the professional fire units have 120 seconds to leave the fire departments on vehicle with full equipment, wearing the personal protective equipment (PPE) also. They know how to use their equipment, but what is unknown: What are the real situation at the scene? So they has general PPE's for the general fire task. These can make extra load and limitations for the people (firefighter) who wear them. [1] [2] [3]

Methods

The dangers to the firefighters and effects by the personal protective equipment analysed in two research before by the author, in this presentation the main parts of the investigation describing. [4]

Results

Turnout gear Heat stress, tiredness, limited movement, additional weight, hinders thermoregulation
Breathing mask Limits the view because of distortion and decreased sight degree
Helmet Reduced hearing
Gloves Hinders fine movements. Loses sensitive tactile perception
Climbing safety belt Can get stuck in objects. Can make damage after falling

Discussion

Despite the different and wide-range protective equipment, the constant trainings there are happens accidents in the line of duty all over the world such in the field of firefighting. Future investigation needs, how to decrease the extra load and extra dangers by the PPE's worn. [7] [8]

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LNG CONDITIONAL SCENARIO FLOW MODEL for INCIDENTS in ROAD TRANSPORT

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Abstract

A shift towards broader use of LNG is economically and environmentally justified. However, it triggers an obvious need for investigating on LNG risk through elaboration and validation of potential scenarios, the hazard might generate if materializes. This background knowledge and past experiences were elaborated in order to fulfil the poster's aim which is designing the LNG Conditional Scenario Flow Model for such cases as storage in a tank, road and pipeline transport. The model is conditional since the concept complies the emergency mitigation measures undertaken on different phases of the scenario development. This presentation is dedicated to fulfil this aim by answering the following question – what are the key scenario lines LNG incidents might follow? The proposed model is a suitable tool to be implemented for first responders and educational, training purposes. Furthermore, it might be utilized as a supporting scheme for pre and post incident analyses.

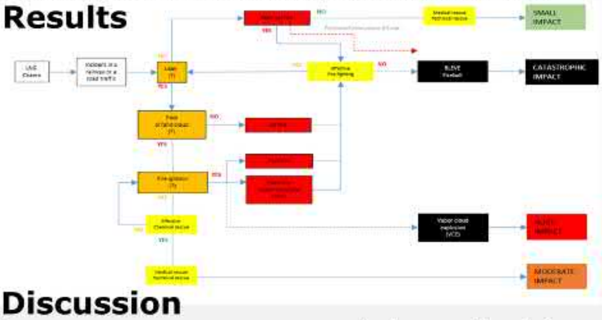
Introduction

LNG has plenty of advantages. However, as a hazardous material, it may potentially lead to development of dangerous scenarios with variable impact, in its character and range. Such scenarios will naturally be determined by the physicochemical properties of LNG, as a natural gas liquefied under low temperature mixture. It is mainly composed of methane but also ethane, propane, butane and pentane as well as carbon dioxide, helium, nitrogen and hydrogen sulphide. Boiling temperature is generally about -162°C and odourless, colourless, non-toxic, non-corrosive and lighter than water. At high LNG concentrations the oxygen content in the air is reduced below the level necessary for life (below 12,5%), cryogenic and flammable liquid, therefore its characteristic surely defines the key hazards related to potential incidents with its presence.

Methods

Review of published research on LNG risk in transport. The referenced sources had been surveyed by searching for terms "LNG", "liquefied natural gas", "LNG safety" and "LNG fire" in the ResearchGate and Academia portals. Next, the abstracts of the revealed articles have been read towards selecting these ones which dealing with LNG road and railway transport. Articles connected to LNG safety have been selected for full reading. Existing standard operating procedures and emergency response protocols, reports from LNG incidents including LNG trucks accidents were analysed. The research was facilitated by field experiments carried out at the Field Training and Rescue Innovation Centre of the Main School of Fire Service in Poland. The experiments included a real release of the LNG from a truck tanker in order to observe how LNG is dispersing in changeable atmosphere conditions, how it reacts while ignited in different moments of the cloud and pool formation generating different types of fires.

Results



Discussion

Emergency response measures are to be considered for specific scenario lines presented in figure e.g.: the truck is in fire, however, LNG leak, if exist, is not involved in the combustion process. BLEVE and FIREBALL can occur in such an event, although this is unlikely to happen as the LNG is transported under atmospheric pressure (not compressed). The estimated heating time for the tanker, after which a BLEVE and FIREBALL explosion can occur, is about 45 minutes - if the tanker has safety valves. A leak from the tank which is ignited forming a jet fire or a pool fire. A leak which has not been ignited will form a pool or cloud depending on atmospheric conditions. Effectiveness of emergency response measures designed and introduced on certain points of the conditional scenarios development will determine which line the scenario finally goes. LNG Conditional Flow Scenario Model has been designed in order to facilitate preparation, organization, realization and evaluation of trainings and exercises on LNG as well as to support post incident analyses.

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Identifying Firefighters and Vehicles on the Fire ground

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Abstract

The ability to identify and distinguish firefighters and vehicles is a key factor on how transparent the fire ground is. A survey previously conducted amongst firefighters reveals that it is necessary to better mark individual firefighters, the incident commander and firefighting vehicles. Individual firefighters can be marked by their call signs on their helmets, turnout gear and SCBA. Incident commanders and other crucial positions can use armbands, collars and vests to mark themselves. Magnetic or suction cup panels identify vehicle call signs, while adhesive labels can be used for technical parameters and roof markings.

Introduction

To maximize the efficiency of the firefighting command structure, it is critical to have an overview of the personal and equipment involved in the incident. To achieve this, these have to be marked visually in an unmistakable way. [1][2]

Methods

For this poster the identification solutions of the fire services around the world are analyzed.[3]

Identifying individual firefighters

Individual firefighters can be marked by name, badge number or radio call sign. Using the call sign has the tactical advantage of relay the current assignment.[4]

Marking solutions for firefighters

Marking solutions for command roles

Marking solutions for vehicles

Results

An effective incident command organization needs a suitable identification system. It is crucial to implement a solution that fits into the existing command structure and is also easily adapted by every member involved in the incident response. Removable and exchangeable solutions with Velcro or magnets on helmets, turnout gear and/or SCBA are easily adjusted to the different assignments of each shift. Colored vests can be used to distinguish different command roles at incidents.[5] Interchangeable signs with magnets or suctions cups can be used to mark the active call sign of a vehicle. It is recommended to mark the vehicle parameters as well, to quickly ascertain their capabilities. [6]

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New capabilities in the Hungarian Radiation Early Warning and Monitoring System

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Abstract

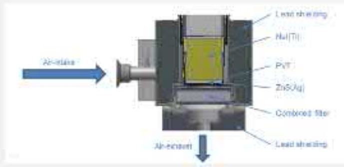
The Automated Radiological Industrial Safety Telemetry Network (RTH) part of the Hungarian National Radiation Monitoring, Signalling and Control System operated and maintained by the National Directorate General for Disaster Management has been modernised in recent years. In this modernisation process, 4 online radioactive aerosol and iodine monitors and 30 ambient gamma dose rate and meteorological parameter measuring stations were installed in this network.
The unique automatic filter changer capability of the aerosol monitoring station makes it possible to operate the system unattended for at least one year and collect accurate real-time data regarding the current activity concentration of airborne radioactive alpha, beta, gamma active particles. The development of the new generation of the aerosol stations started in 2018 at Gamma Technical Corporation.

Monitoring stations

Systems for the measurement of radioactive materials released into the air and water have long been operating in nuclear facilities. The existence of such a system is a prerequisite for the establishment and operation of such a facility (1). In case of an emergency, contamination can bypass the emission (stack) monitoring system and the only way to know what happened is to install monitoring stations around dangerous facilities (2). At the moment the data center handles more than 600 stations in the RTH system (3). The information is coming directly from the monitoring stations through LTE modems and from organisations (foreign, domestic) trough data exchange regulated by a bilateral agreements.

Aerosol and Iodine measurement

The Aerosol station draws the air samples through a combined filter (aerosol, PACI, activated carbon), which absorbs >99% of the elementary, organic and aerosol form of radioactive iodine. The filter captures not only radioactive iodine but also other radioactive aerosol contaminants.



The instrument simultaneously and separately evaluates the absorbed alpha, beta and gamma activities using a scintillation detector.
One detector simultaneously measures the alpha (ZnS(Ag)), beta (plastic) and gamma (NaI(Tl)) radiation with different scintillator material. The detector has an automatic self-calibration mechanism applying the always available K-40 peak in the spectrum to change the high voltage accordingly. The most challenging part was in this development the compensation of the high-temperature dependence of the detector.
The isotope identification makes it possible to determine nuclide specific activity concentration (i.g., Cs-137, Co-60…).

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The Adopted Approach to the disaster management of Covid-19 Pandemic in Jordan /role of the National Center for Security and Crisis Management (NCSCM)

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Abstract

Jordan is a developing country in the Middle East. The country embraced disaster risk reduction (DRR) -as it is a new disaster risk management (DRM) approach- is controlled by establishing and implementing the National Center fro Security and Crisis management (NCSCM). During the research special relevant literature was studied. And correlation with the objectives of such important center duties were presented in this poster. This poster shed the light on the main goals, followed strategies, data analysis and the achievement of NCSCM in terms of disaster risk reduction(DRR), a case study was conducted on its role/approach during the Covid-19 Pandemic and its consequences.

Establishment of NCSCM

The idea of creating a National Center for security and crisis management in Jordan came as a result of high property vision which called for a State of interaction and responding to the strategic environment discharge, in accordance with an institutional perspective, based on the principle of coordination uniting national efforts to address potential crises. It was built in accordance with Global standards and specifications of the operational and technical terms, and it was published in the Official Gazette and become effective as from the first of April of the year 2015 [1].

Goals and strategies of NCSC

As an approach of DRR , The National Centre aims for security and crisis management to achieve its vision and mission through harnessing national and unifying efforts of relevant national institutions in order to reach professionalism in preparedness and response to national crises – both natural and man – with less effort, time and cost and possible losses. The followed strategies are [1] :
*International strategy for disaster reduction [2].
*Arabic strategy for disaster risk reduction 2020 [3][4].

Jordan's Multidisciplinary Approach to Management of COVID-19

The policy of the adopted approach was based on the fact that all components of the health system should be strengthened and supported to be prepared to deal with the influx of cases all over the country. All sectors have to collaborate and pool their efforts. COMMUNICATION should be strengthened in order to deflect disinformation and rumors and prevent panic. This should be directed at all sectors [5][6][7].

NCSCM will create a dashboard tool to be used for daily monitoring and tracking

NCSCM will create a dashboard tool to be used for daily monitoring and tracking

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Demonstration of hazardous soil contaminants from a disaster management perspective
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Abstract
Contaminants entering the environment pose a serious risk both to humans and the ecosystem. Depending on the specific properties of the soil and the pollutant, contamination may spread into the surface or groundwater. Harmful substances entering the human body through direct or indirect uptake from soil and water can cause nervous system damage, cancer or even death. Due to the high level of industrial activity, it is important to handle these materials properly and to comply with the relevant safety regulations. Our aim is to present the most common soil contaminants, covering their possible sources and hazards.
Landfill
Gas and dust emission
Transport and transportation
Soil, surface and groundwater pollution
Industrial activity, mining
Source of contamination
Soil
Fate of pollutants
Bioaccumulation, biomagnification
Agriculture
Sorption
Atmospheric deposition
Radioactive isotopes
Biodegradation
Introduction
Effective removal of contaminants that have entered the soil as a result of human activity requires a comprehensive study of the soil and the environment.
In case of a damage event, risk of contamination spread as well as threat to health and ecology has to be assessed.
Organic contaminants
Organic solvents, hydrocarbons, insecticides, fungicides, herbicides, fertilizers, and pesticides all belong to this group, with different properties and hazards.
E.g. Plaine-de-la-Crau (Bouches-du-Rhône), France 2009
Inorganic pollutants
Inorganic chemicals include potentially toxic elements, acids, alkalis, and salts of these compounds. An accident can cause serious damage in both the short and long term, a good example for this is the red mud disaster in Ajka.
E.g. Ajka, Hungary 2010.
Radionuclides
As opposed to low natural radioactivity levels, radioactive material released into the environment during anthropogenic use might have long-term negative effects. Radioactive isotopes are mainly used for energy production, in medicine and warfare.
E.g. Hanford Site, Washington, USA
Summary
Organic-, inorganic compounds and radioactive isotopes are present in all segments of our lives. As modern society is no longer conceivable without the use of these materials, emphasis should be placed on pollution prevention, research and dissemination of knowledge.
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https://www.conserve-energy-future.com/causes-and-effects-of-soil-pollution.php
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Institute for Soil Sciences, Centre for Agricultural Research, ELKH
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LIFE ("The Financial Instrument for the Environment") is a programme launched by the European Commission and coordinated by the Environment Directorate-General (LIFE Units - E.3. and E.4.) ISBN 978-92-79-34664-4, ISSN 2314-9329
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Remediation board versus protective ring

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Dr. Zsolt CIMER – UPS associate professor
Ádám BERGER – UPS doctoral student

[1]

Abstract

Different containers are being used in the industry to store hazardous liquids that vary in shape, size, and dimensions. The damage to the storage tanks may result in leakages, fires, or explosions. Injury can be caused by, fatigue, human negligence (25.03.2010. MOL Csepel Base station, Hungary), terrorism (21.01.2016. Ras Lanauf, Libya), or an environmental impact (03.06.2008. Magellan Terminal, Kansas City, USA). In this case, the hazardous material starts leaking, depending on the extent of the damage, furthermore a container fire will develop in the presence of an ignition source. A receiving space is established around the tank in order to control the leakage or loss caused by the accident. This study aims to present the advantages and disadvantages of receivers types used in hazardous material storage tanks.

Receivers types

In terms of design and material use

- remediation board:
  - reinforced concrete structure,
  - sheet steel structure;
- protective ring:
  - reinforced concrete structure,
  - sheet steel structure.

[2]

Concerning the required space, in the case of the remediation board, the distance between the shell of the tank and the protective wall is much greater than in the case of protective rings. [3]

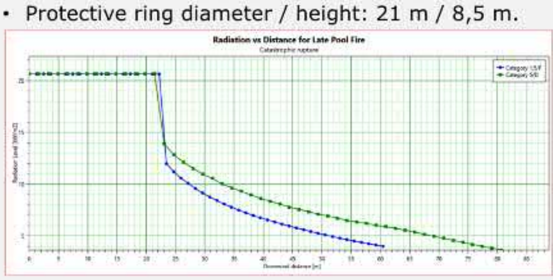
Allegation

The receiving space will be smaller during a possible damage event than in the case of the remediation board as a result of the required space for the two types that the fire surface created in the protective ring. This is the main difference when comparing the two designs.

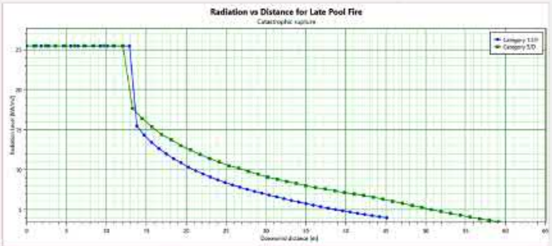
Proof

DNV SAFETI LITE - Model parameters:

- Nominal volume: 2 000 m^3;
- Materirial: 1 900 m^3 n-hexan;
- Tank diameter / height: 16 m / 10,5 m;
- Remediation board width / length / height: 27 m / 37 m / 2,5 m;
- Protective ring diameter / height: 21 m / 8,5 m.



Tank with remediation board (Authors)



Tank with protective ring (Authors)

Evaulation

Advantages and disadvantages of receivers types (Authors):

Aspect	Remediation board	Protective ring
Area requirements	-	+
Construction price	-	+
Fire surface size	-	+
Amount of inoculative	-	+
Air emissions	-	+
Tactical intervention	+	-
Stability	*	*
Operation	-	+

* In both cases, reinforced concrete and steel sheet are used.

Is the decision easy?

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[1] Pictures © CNES / Airbus, Maxar Technologies, 2021 – Budapest, XXI. kerület
[2] Chiltern Air Support - Buncefield after the incident: Tank 912 is in the centre foreground and Tank 12 is in the top left of the picture
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VÉDELEM ONLINE

Fire Engineering & Disaster Management
Prerecorded International Scientific Conference

How to locate central service points for emergency services?

Chris Hetkämper (Institute of Rescue Engineering and Civil Protection – TH Köln)

Abstract

A methodology is presented for determining optimal positions for central service points to **secure the fuel supply** of spatial distributed properties in the event of a long-term power outage. This approach is based on a **multi-stage network analysis**, which considers the **accessibility**, **optimal positions** via location-allocation analysis, and **performance** via vehicle routing analysis.
The methodology could be used as a planning tool for fuel supply systems. However, weaknesses are revealed by the level of detail in the network dataset and the lack of speed parameters during a power outage for routing analysis. Thus further research or in situ adaption is needed for more practical results.

Introduction

- a long-lasting power outage has far reaching and cascading consequences [1,2]
- **Critical Infrastructure** (CI) systems and facilities are therefore often **equipped with fuel operated emergency power supply units** to keep operational during power outages. [e.g. 3]
- This states no problem as long as the fuel is not running low due to the duration of the incident.
- Thus a **solution** is needed to **supply emergency power supply units** during long-term power outages.

Methods

- Scope of the methodology is to **identify locations** for **central service points (CSP)** to **supply multiple spatially distributed properties** with fuel

1. At first suitable properties which could serve as a CSP are identified.
2. A **location-allocation analysis** is conducted to search for optimal CSP locations.
3. These undergo an evaluation via the **vehicle routing problem** to test if the **supply performance** would suffice.

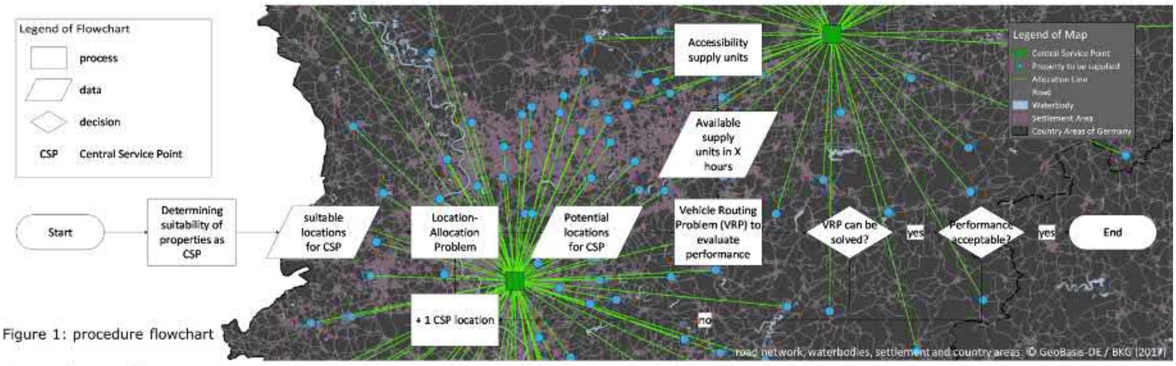

Figure 1: procedure flowchart

Evaluation

1. To evaluate the performance, the **accessibility** of the CSP with supply units **in X hours** is assessed.
2. With the count of these units a Vehicle Routing Problem (VRP) analysis is conducted.
   a. If the **VRP** can be **solved with the given amount of supply units** without risk of an outage, the evaluation is finished.
   b. Otherwise it is necessary to redo the location allocation problem with one more CSP location.

Performance is **influenced by many factors:**
it could be reasonable to use **more CSP locations** than necessary **to reduce the amount of supply units** and **drivetimes.**

Results

The methodology turned out to be **applicable** in the **validation of three example scenarios**. But one major shortcoming is, that the **drivetimes** for the routing analyses had to be **assumed** and the results can be **inaccurate** with **data of low detail** for the road network.

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Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Environmental safety effects of micropollutants and microplastic

Tamás Parrag, Dr. Lajos Kátai-Urbán, Dr. Zsolt Cimer

Abstract

With the development of technology and the growing population, our world needs to develop new materials. Due to the technical shortcomings of wastewater treatment and waste management, pollutants can be released into the environment. Assessing the health and environmental risks of these substances is necessary to sustain human civilization. Micropollutants have emerged in the last half century due to the development of a major industry, man has created the new pollutant microplastics using more and more artificial plastics. By optimizing industrial safety, emissions of micro-contaminants and micro-plastics can be minimized.

Micropollutants

Inorganic micropollutants

- Heavy metals, metals
- Barium
- Arsenic
- Cyanides
- Radioactive Materials and Isotopes

Organic micropollutants

- Petroleum and its derivatives
- Multi-ring aromatic hydrocarbons (PAH)
- Polychlorinated biphenyls (PCBs)
- Chlorinated hydrocarbons, trihalomethanes THM
- Detergents
- Surfactants
- Pesticides,
- Drugs
- Flameproofers
- Complexing organic compounds (EDTE, EDTA)
- Resistance genes
- Medicines and cosmetics (PPCP)
- Perfluorinated substances (PFCs)
- Lifestyle products, food additives, sweeteners
- Disinfection by-products
- Burning by-products
- Organometallic compounds

Cleaning technologies for the removal of organic micropollutants:

- Oxidation [O_3; O_3+UV; H_2O_2+UV; Fe(VI)]
- UV + TiO_2 catalyst
- Sonolysis + TiO_2 catalyst
- Radiolysis of water with ionizing radiation
- Adsorption on activated carbon
- Reverse osmosis, Membrane (ultra, nano) filtration

References:

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Microplastics

The small pieces of plastic found in the aquatic environment settle to the seabed, the bottom of the lake, the bottom of the river where they become the food of the living organisms living there, thus entering the food chain, during which they also get into the human body. The process is illustrated in detail in Figure 1.

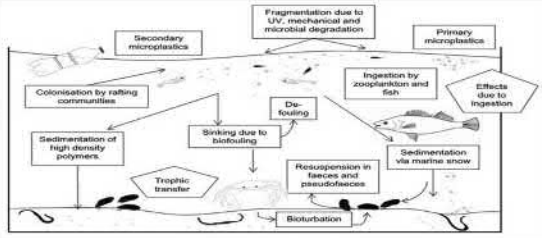

Figure 1: Potential pathways for the transport of microplastics and their biological interactions (Wright et al., 2013. © Elsevier)

The inhibitory effects of nanomaterials and microplastics on human cellular tissues have been studied. Only minor acute toxic effects were observed in the study, depending on the composition and physical form of the microplastic and nanomaterial. But further studies are needed to determine where toxicity can be caused by microplastics and nano-plastics, as illustrated in Figure 2.

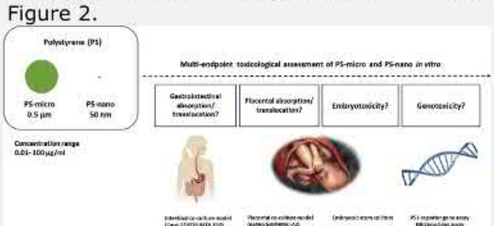

Figure 2: Multi-endpoint toxicological assessment of PS-micro and PS-nano in vitro (Michelle Hesler et al., 2019. © The Authors. Published by Elsevier Ltd.)

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Knowledge Centre for Water Sciences and Disaster Prevention
Budapest University of Technology and Economics
Faculty of Civil Engineering
INTRODUCTION
VK-TUDÁS
Our mission:
✓ Bridge cutting-edge engineering methods in disaster prevention
✓ Close cooperation with stakeholders and industrial partners
✓ Coordination of R&D&I activities
✓ Enhancing competitiveness in R&D&I
Industrial safety, fires and explosions
Environmental emergencies
Floods
Earthquakes
Water sciences
R&D activities at glance:
Our research groups work on mitigation of risk from natural or man-made disasters, early warning, emergency management and post-disaster reconstruction and damage assesment.
Highlights of our expertises:
❑ Extreme flood and ecological status assessment on rivers
❑ Large-scale water management and water quality research
❑ Safe drinking water supply and efficient wastewater treatment
❑ Climate vulnerability, adaptation and sustainability
❑ Monitoring and risk assessment of flood defenses and critical facilities
❑ Prevention and management of industrial disasters
❑ Earthquake vulnerabily assement
❑ Protection of engineering structures and historical monuments from seismic risk
❑ Design of nuclear facilities to protect against extreme impacts
❑ Impact of fire and explosion on engineering facilities
❑ Flame retardancy
Operative actions:
✓ 26th November 2019 a earthquake of magnitude 6.4 hit Albania near the costal port town of Durres
✓ Our engineers surveyed on-site 150 buildings to esses damages and impact on structures
Operative actions:
✓ 29th May 2019 a tour boad called Mermaid (Hableány) got struck by a large cruise ship in a tragic accident, killing 28 people on board on the Danube River in Budapest, Hungary
✓ Our engineers worked on site with the first responders to assist in the recovery of the wreck.
✓ Fundamental question of the dangerous operation to raise the wreck was where to attach ropes for lifting to avoid further serious damage.
Our major Projects:
✓ Risk assesment: KEHOP-1.1.0-15-2016-00003 Development of new national risk assesment method together with the National Directorate General for Disaster Management, Ministry of Interior (OKF)
✓ TKP2020, Institutional Excellence Program of the National Research, Development and Innovation Office (ITM) in the field of Water Sciences & Disaster Prevention (BME IE-VIZ TKP2020)

Kálmán Serfőző – György Pátzay – József Dobor: Disaster management representation and summary of the most important elements, controllers, systems and devices required for the operational safety of a fictitious hazardous plant

Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Disaster management representation and summary of the most important elements, controllers, systems and devices required for the operational safety of a fictitious hazardous plant

Kálmán Serfőző *second-year college student majoring in industrial safety majoring in disaster management; University of Public Service; Institute of Disaster Management*

György Pátzay *prof. Em. University of Public Service; Institute of Disaster Management*

József Dobor *associate prof. University of Public Service; Institute of Disaster Management*

Abstract

Due to their activities (transportation, manufacturing, warehousing) and the substances they use (raw materials, indirect materials, finished products), plants handling dangerous substances pose constant risk to the constructed and natural environment, and particularly to air, soil and the surrounding population. During the operation of the plants, such risks need to be analyzed on an ongoing basis, as environmental hazard may increase as a result of substance releases, equipment malfunctions or incorrectly performed maintenance activities. Environmental impacts of hazardous facilities can be effectively reduced by using the various elements of the Safety Management System.

Key elements of the Safety Management System

Summary

The storage and use of hazardous substances and waste always poses a high risk to soil creators, as even small amount of hazardous substances can contaminate large amounts of soil, which requires a great deal of material and time to eliminate. Therefore, we can conclude that our most important task is to avoid soil contamination through risk mitigation procedures. With the help of the elements of the safety management system defined by the Seveso Directives and the legalization related to the Hungarian disaster protection, as well as the measures presented by us, the events on environmental pollution of hazardous substances can be effectively avoided.

Hungarian regulations

Act CXXVIII:2011 on disaster management
Act XXV:2000 on chemical safety
Act LIII:1995 on general rules for the protection of the environment
Government Decree 219/2011 (Oct 20) on the protection against serious accidents involving hazardous substances

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Characterization, use and hazards of chemicals with hazardous properties that may occur in nuclear power plants

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Abstract

The most significant part of the chemical use of a nuclear power plant is required for the preparation of additional feed water, wich is fundamental for the water-steam cycle. There are professional reasons for the day-to-day use of chemicals with hazardous properties in a nuclear power plant. Of course, working with these dangerous materials requires serious preparation and attention.

Introduction

The amount of chemicals applied is influenced by the amount of make-up water required by the power units and the salinity of the Danube water. Additional chemicals are used for adjusting the parameters of primary and secondary circuit water, for preservation during unit downtimes, and for the regeneration of primary and secondary circuit ion exchange resins.

Industrial Gases/ Nitrogen

application possibilities

Liquid state: it is used for cooling dosimetric instruments. Gas form: its used for diluting primary gas blows, cleaning technological pipelines, displacing hydrogen from generators and tanks.

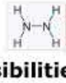
characterization

Nitrogen is a colourless, odourless, tasteless gas that is the most plentiful element in Earth's atmosphere, its chemical formula is N2.

hazardous properties

Nitrogen can displace oxygen from ambient air within an enclosed space. Inhaling air containing mostly nitrogen will lead to sudden unconsciousness and death due to asphyxiation.

Hydrazine



application possibilities

In nuclear power plants hydrazine is mainly used for adjusting the chemical parameters of primary and secondary circuit water, its applied as a oxygen scavenger to control concentrations of dissolved oxygen in an effort to reduce corrosion.

characterization

Hydrazine is an inorganic compound with the chemical formula N2H4. It is a simple pnictogen hydride, it's a colourless flammable liquid with an ammonia-like odour.

hazardous properties

Exposure to hydrazine can cause irritation, burning, pulmonary edema, headache, depression, temporary blindness and coma. It's recognized as a potential cancer-causing chemical.

Acids / Hydrochloric acid

application possibilities

At the nuclear power plant of Paks approx. 1 million m3 of desalinated water is produced annualy by ion exchange purification. HCL is used for the regeneration of ion exchangers.

characterization

Hydrochloric acid is a colorless, transparent liquid, fumes in air if concentrated, with a distinctive pungent smell. It is classified as a strong acid.

hazardous properties

Causes severe burns. Inhalation can lead to pulmonary edema. Ingestion can cause severe injurys. Other effects include shock, circulatory, metabolic acidosis, and respiratory depression.

Summary

There are specific reasons for the day-to-day use of chemicals with hazardous properties in a nuclear power plant, they are essential. Working with these materials requires serious preparation and attention. There are Mobile Laboratories for Disaster Management in every county of Hungary, which provide effective support at salving complex damage event's. The continuous development of the primary intervention team's is a serious challenge. The aim of the authors is to further research this topic and report on its results in publications!

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Fire Engineering & Disaster Management
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Summary, characterization, potential hazards of radioactive isotopes, which are most often used in industry and healthcare

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Abstract

The purpose of the poster was to give a short professional presentation of the most commonly used radioactive isotopes. Its two largest users are healthcare and industry. It can be somewhat contradictory that these radioactive isotopes can cause extremely severe damage to the human body without control. However, they are practically indispensable for various processes nowadays. In Hungary, due to strict regulations, damage events related to radioactive isotopes are relatively rare. The use of radioactive isotopes has been ongoing in most countries on earth since the early decades of the 1900s.

SUMMARY

The number of radioactive isotopes is approximately above 2,000, a significant part of which can be characterized for practical use. An additional aim of the authors is to research this topic. Case study of disaster management in some case studies of some typical European damage events in order to learn lessons. In Hungary, the Seven Disaster Management Radiation Detection Units carry out the detection and assistance in response, thus reducing the escalation of the event and its negative impact on the population.

STRONTIUM-90

application possibilities: The strontium-90 isotope has industrial and health care applications. In the industry, they are used for measurement purposes, for example checking the fill level of cigarettes in the factories. [1]

characterization: This instable isotope emits Bate radiation during decomposition. It has a half-life period of 28 years. The amount of heat emission is relatively huge: 0,91 watt/g. According to observations in Chernobyl, this material's rate of decomposition in air is lower than caesium's, due to its less volatile nature. [2] The strontium is an alkaline earth metal. Its stable isotopes can be found in rock formations, such as sandstone, but on the other hand, the radioactive isotopes are rather artificial in origin, like the strontium-90 itself. [3]

hazardous properties: There has been some accidents, where strontium has leaked into the air and has spread. Good examples are Fukushima, Chernobyl and the river Techa. Similarly to Calcium, it emits beta radiation, which can be dangerous getting into out bodies, because it can cause bone cancer or leukaemia. It can also damage our DNA, increasing the chance of tumour development.[3]

NICKEL-63

application possibilities: The Nickel 63 isotope is mainly used in cases of detecting explosive materials, but you can find it in general electronic devices, like voltage controllers and current overflow protectors. [1]

characterization: This isotope emits beta radiation during decomposition. The n-life period is quite long: 96 years. Nickel is a strong, shiny, light silver material. [4]

hazardous properties: It has some harmful effects, but only when it reaches someone's immune system. The beta particles from the radiation increase the risk of cancer. [4]

AMERICUM-241

application possibilities: Smoke detectors are the most common use cases of Americium-241. Additionally, it is often used for measuring the lead level in paint samples. [1]

characterization: Americium-241 is an isotope, which emits alpha radiation, and it has half-life period of 432,2 years. [5]

hazardous properties: Breathing it in or swallowing it, usually it settles in our body for decades, concentrated in the bones, liver or in our muscles. This phenomenon can expose nearby tissues to really serious radiation, increasing the chance of cancer development.

IRIDIUM-192

application possibilities: It is commonly used in health care in radiation therapy and also in the industry for checking the physical condition of pipelines, aircraft parts or furnaces for example. [1]

characterization: It emits gamma and beta ra and has a half-life period of 73,83 days. This dense metal is coloured light silver and does not corrode. [6]

hazardous properties: It has also a great chance of raising the risk of cancer developm External exposure may cause burn, acute rad syndrome or even death. Internal exposure c burn in the stomach or in the guts. [6]

RADIOACTIVE

CAESIUM-137

application possibilities: In health care, the most common use cases are curing cancerous tumours and making treatment plans, such as determining the proper dose for the patients. The industrial uses of Caesium-137 are for example liquid flow measurement in oil pipes and fill level measurement in food- or pharmaceutical industry. [1]

characterization: It has a half-life period of 30,17 years and it emits beta- and also gamma radiation. It is in liquid state at room temperature and it bonds well with chlorides, so it turns into powde

hazardous properties: In large quantities, external exposure can cause burn, acute radiation syndrome and death. Also, it increases the risks of cancer. Internal exposure: The fact, that it spreads in soft tissues, increases this risk even further. [7]

TECHNETIUM-99m

application possibilities: Technetium-99 is one of the most commonly used isotopes in health care, mainly for brain, kidney and liver imaging.

characterization: It is the by-product of nuclear fission of uranium, and it can be found in uranium ore in small quantities. This material has 22 instable isotopes. This light silver coloured metal dissolves well in sulfuric acid and nitric acid. It emits gamma radiation and has a half-life period of only six hours. It is a really rare in nature and people can find it only in small quantities. This is the reason why we produce it artificially from uranium in nuclear reactors.

hazardous properties: It's presence can be harmful for fetuses and little children.

COBALT-60

application possibilities: This isotope has several medical applications, such as in the treatment of cancer. During radiation therapy, they use cobalt machines to get these particles into the treated tissues. Cobalt-60 is also used to sterilize surgical equipment and it is also used in the food industry. [1]

characterization: This metal has grey colour and does not oxidise at room temperature. It has half-life period of 72 days.

hazardous properties: The IAEA (International Atomic Energy Agency) classifies this material as one of the most dangerous radiant elements. It has very harmful effects on our immune system, because it takes about a few minutes to reach the fatal dose.

IODINE-123

application possibilities: There are some diseases where the problem is usually the abnormal activity of the thyroid gland. At the point of regular medicines being ineffective, curing this kind of diseases is a common use of Iodine-123. [1]

characterization: Its behaviour is really similar to the stable Iodine, except for emitting gamma radiation. It has a half-life period of 13,2 hours. It spreads fairly quickly in the body, so the treatment can't last more than 1 hour. [8]

hazardous properties: Iodine-123 oxidises quite well. Out immune system's reaction to instable iodine is like the reaction to its stable form. As a reason, our thyroid gland also stores the radioactive Iodine, which has unhealthy effects. [9]

IODINE-125

application possibilities: It has been used for decades in the treatment of cancerous tumours. It is called brachytherapy when doctors use Iodine-125 for this purpose. Additionally, it can be used also to cure melanoma.

characterization: Iodine-125 has a half life of 60 days, and it emits gamma and X-radiation during decomposition.

hazardous properties: Exposure may result in abnormal activity of the thyroid gland, and also increases the probability of cancer development. [10]

IODINE-131

application possibilities: In addition to curing subnormal thyroid activity, Iodine-131 is also used in thyroid cancer treatments. The method is based on the fact, that radioactive iodine kills cancer (and unfortunately also healthy) cells, if it reaches our thyroid through the bloodstream. [11]

characterization: It has a really short half-life period of only 8,02 days and it is quite volatile.

hazardous properties: When it comes to nuclear accidents, the presence of Iodine-131 must be strictly checked in foods like milk and vegetables, especially in spinach ant lettuce. It emits a high energy gamma radiation. In small doses, the side effects are swelling of the salivary gland, nausea, dry mouth.

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Detection of post-earthquake building damages in Zagreb based on Sentinel-1 radar data

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Abstract

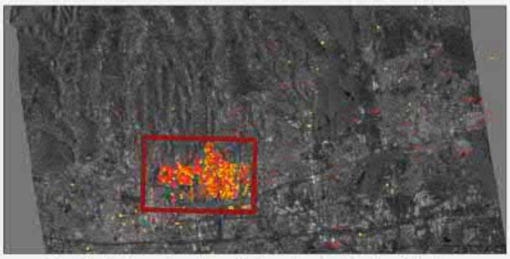
On this poster we summarize our GIS analysis results in connection with the earthquake in Zagreb in 2020. According to Markusic – Herak (1999) the Zagreb epicenter area is the most active one in the continental part of Croatia. The return period of a magnitude 6 earthquake is expected to be 150 years (Lokmer et al, 2002). Most of the earthquake damage in Zagreb was suffered by the housing sector (64%), followed by the culture and cultural heritage sector, including historical government buildings (13%), education (10%), health (8%), and business (5%). As a response, the Croatian Government activated a Copernicus task to support the damage assessment process and the monitoring process of building recovery. By this analogy, we tried to detect the building damages in the area of Zagreb's city centre, using free satellite radar (Sentinel-1) data to testing its applicability.

Introduction

Located in Southern Europe, Croatia belongs to the Mediterranean-Trans-Asiatic high seismic activity zone making it one of the most earthquake-prone countries in Europe. These earthquake-prone regions spread over approximately 30% of Croatia and are characterized by a relatively dense population and large urban centers. The urban areas of Zagreb, Split, Dubrovnik and Rijeka are of particular economic and social importance with about 60% of the country's population. Zagreb itself, as the administrative, cultural, scientific, economic, and traffic center of the country, accounts for almost 20% of the population and about one third of the country's GDP (Atalić, – Hak, 2014; Novak et. al, 2019).
In this research we tested the opportunities of Sentinel-1 radar images related to the detection of the damages caused by an earthquake on 22 March, 2020 in Zagreb, Croatia. In case of Sentinel-1, we used a method recommended by the United Nations Platform for Space-based Information for Disaster Management and Emergency Response, widely referred to as UN-SPIDER.

Material and Methods

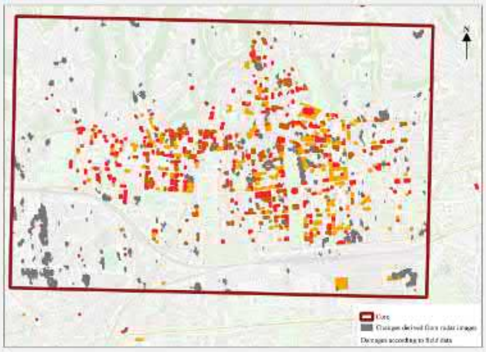
Two radar datasets acquired by Sentinel-1 satellite were downloaded, providing about 20 m spatial resolution, showing the study site 11 days before (11 March 2020) and 1 day after (23 March 2020) the earthquake. The images were both GRD images from an ascending orbit, preprocessed in ESA's SNAP software. According to the step-by-step recommendation of UN-SPIDER, the images were preprocessed by applying orbit files, performing calibration and speckle-filtering (Refined Lee) and terrain correction using a 1Sec SRTM database. A stack was created from the images derived from VV polarization only. A built-in change detection algorithm was applied for the VV images, that resulted in a change layer. We compared the change layer to a reference dataset (Copernicus, 2020) of the real damages in the city center area of Zagreb which was derived from on-site UAV measurements and field measurement.



Sentinel-1 radar data (VV polarization) with the polygons of damaged buildings

Results

We compared the change layer to a reference dataset, and we measured classic thematic accuracy assessment metrics. When identifying two categories (damaged – non-damaged), the Overall Accuracy was 92.5%, traditionally used for measuring the classification accuracy, but the Kappa Coefficient was less then 0 (-0.0009) that means the high overall accuracy was caused by chance. This is also explained by the Producer's Accuracy of the two categories (damaged PA=3.18%, non-damaged PA=96.69%), which refers to the fact that the non-damaged category's PA was high because of the larger proportion of this category related to the other.



Radar change detection results (possible damaged building) and reference dataset

Conclusion

It can be considered as a limitation of the method advised by the UN-SPIDER that the change layer is also sensitive to changes originating from other than small structure destructions. Since the damages of this earthquake were damages in buildings characteristically (Destroyed, Severe damage, Moderate damage, Possible damage), the detection of damages could be strongly limited by resolution of the Sentinel-1 images. However, the change layer of the radar images before and after the earthquake could well approach the concentration of the damages.

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Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Victim Identification After The Hableany Disater

PETRETEI, David
(University of Public Service, Dep. Investigation Theory)

Abstract

In 05. 29. 2019., Budapest, Hungary, the Hableany, a Moskvich-class sightseeing cruise was collided from behind by a twenty-five-times bigger longship, MV Viking Sigyn. The Hableany (a Hungarian word for Mermaid) capsized and sunk in seven seconds. The sightseeing cruise had 35 South Korean citizen tourists as passengers and 2 Hungarian crew members. Seven people were rescued some minutes after the accident and eight dead bodies were found till the morning. In the next weeks, all but one body were found, one South Korean female passenger is still missing.

The processes

After the accident, three processes have started:
- a criminal investigation, conducted by the Police of Budapest, because of a crime against maritime safety cause a mass fatality incident.
- a rescue operation, conducted by the Counter-Terrorism Centre (TEK), with the participation of the Hungarian National Organisation for Rescue Services (OKF), Hungarian rescue divers, the „Cobra" special military diving unit of Austria, and military diving troops of South Korea.
- a victim identification process following the Interpol Disaster Victim Identification (DVI) standards. This process was led by the National Bureau of Investigation (KR NNI) and performed by the DVI Hungary, which is not an officially approved entity. Fingerprint experts of South Korea also joined.

All of the victim identification processes were fulfilled under the Interpol DVI Guide. This was a perfect framework for the Hungarian and South Korean DVI Teams. The official DVI AM and PM forms were filled in English. At the request of the South Korean officials, contrary to Hungarian regulations, no autopsies were performed.

Every South Korean victim but one was identified by fingerprints. The South Korean authorities have the ten-print records of every citizen over 17 years old. Also, the dental record was taken from every deceased. One South Korean victim was found five weeks after the accident and could not be printed, so she was identified by secondary identifiers: scars, jewelry, clothes, and anthropologic features.

Lessons we learned

- the „regular" forensic examination of the deceased is too slow. The process of one body was 150-180 minutes, compared to the DVI PM process, which was 40 minutes.
- the „regular" forensic examination of the deceased resulted in a Hungarian form, which was too detailed on one hand and has a lack of essential information on the other hand.
- the numbering and labeling of the bodies with the DVI numbers were effective and unavoidable.
- although the process had been done under the Interpol standards, in some cases still an inappropriate way was followed. The Hungarian citizen victims were not subjected to the Interpol standard procedure. On the very first day, a Caucasian corpse was found in the water, which was the eighth body, and was excluded from the DVI by visual observing only. One South Korean victim was processed without filling any DVI PM form, yet got a DVI number and label.

Nemzeti Áldozatazonosító Szolgálat DVI HUNGARY

NEMO RESIDEO · HUN · DVI · SEMPER PARATVS

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Second image: https://168ora.hu/data/cikkek/168/1690/cikk-168045/busor_ft_800x1000.jpg (2021. 02. 15.)
Third and fourth images were taken by the author.

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Knowledge FOr Resilent SoCiety

Mirjana Laban, Verica Milanko, Vlastimir Radonjanin, Suzana Draganić, University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia

Abstract

In recent years the number and severity of natural and man-made disasters, as well as fires, has significantly increased. Education in Disaster Risk Management and Fire Safety field in Western Balkan countries should provide national highly skilled professional resources and regional capacity for resilient society. The aim was to build regional-based disaster preparedness and a culture of safety and resilience at all levels according to EU Integration Strategies and National relevant strategies in Albania, Bosnia and Herzegovina and Serbia.
Project Knowledge FOr Resilient society – K-FORCE was selected for funding under ERASMUS+ programme Capacity Building in Higher Education – EAC/A04/2015. The paper presents the project results.

The project idea

Western Balkan needs to improve the resilience to hazards are recognized as needs for experts capable to improve regional capacity/cooperation in risk prevention and response.
Preliminary survey (2015): very few similar study programs in Serbia, only few modules in Western Balkan – not enough available recourses to improve existing or establish new education programs, and no PhD studies to ensure the sustainability of existing programs. We needed assistance from more developed Higher Education Institutions and EU.

Fig. 1. May 2014: Floodwaters in Balkans covered an area larger than 22,000 km, dozens of killed people, estimated damage was 3 billion euros

In three and a half year K-FORCE project implementation period seven curricula were modernized or developed and implemented in the Western Balkan, followed by LLL courses and E-Library, numerous guest lectures and developed network for research and cooperation.

Project results

Four Disaster Risk Management & Fire Safety Engineering (DRM&FSE) academic master programs/modules (MP), DRM&FSE PhD program (DP), Protection Engineering vocational MP and Financial Resilience academic MP were implemented in Albania, Bosnia and Herzegovina and Serbia: 78 courses were innovated / developed, accredited and 62 implemented, due to the principle of electability at MPs. B-Learning material has been developed for all completely new implemented courses and 262 students were enrolled during project period.
PhD studies development was based on WBR needs, disaster trends, available recourses and novel approach provided by EU partners; started in 2020, with 12 students enrolled. Research area and themes were selected based on WB priorities.
Six books and DRM&FSE Glossary were created and published in ENG/ALB/BH/SRB, in open access at K-FORCE website.

Conclusion

Resilient societies are based on knowledge and training, as well as preparedness. Acquired knowledge in the field of Disaster Risk Management and Fire Safety Engineering will provide the base for building a resilient society. It is necessary to build countries' own, consistent and compatible capacities in this educational field, which will enable a uniform level of required knowledge and skills.

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Radiation protection devices for nuclear emergency preparedness

László Manga, Dr. Lajos Kátai-Urbán, Prof. Em. József Solymosi

Abstract

In the event of a nuclear accident, the availability of radiation protection data is crucial. These data influence interventions, thus protecting the environment and the population. There are several methods available today. There may be different considerations when choosing these methods. Consideration is speed, accuracy, safety or a combination of these. The importance of these is supported by previous accidents such as Chernobyl or Fukushima. Had these methods been available at a given place and time, the damage to the environment and the population could presumably have been reduced. These methods are described below. With a rational combination of these methods, a possible accident situation can be successfully mitigated or eliminated.

Land methods with a special vehicle

Advantages:
- Monitoring large areas relatively quickly.
- Good equipment (dosimeter, surface contamination measuring, sampling devices, in-situ measurements, other hand-held instruments).

Disadavantages:
- Overcoming terrain obstacles.
- solving any technical problems.

[4]

Land methods by pedestrian reconnaissance

[4]

Advantages:
- Accurate, precise survey capability.
- Good accessibility in some cases.
- Simple deployment.
- Wide range of instruments, implementation of many kinds of measurements.
- Use of compact hand instruments.

[4]

Disadvantages:
- Radiation risks.
- Monitoring is slow.
- Only qualified personnel are eligible.

Other methods

1) Telemetry

[4]

Advantages:
- Fast data delivery.
- Good coverage.
- Quick orientation.
- Unique and compact measurements.
- Pre-built data connection.

Disadvantages:
- Data traffic sensitivity.
- Possibilities of communication error.
- Constant maintenance.
- Compliance with extreme weather conditions.
- Continuous supply of energy.

[own source]

2) Software

Advantages:
- Easier decision making.
- Complex data processing.
- Forecast.
- Modeling.
- Fast, automated data transfer, calculation, alarm, information.

Disadvantages:
- Computer capacity.
- Building networks and connections.
- Risk of computer, network "crash".
- Compatibility, continuous improvement. [2]

[own source]

3) Laboratory

Advantages:
- The most accurate, most accurate measurement option.
- Perform special tests.
- Qualified staff.
- Possibilities of complex tests.
- Providing special conditions.
- Ensuring safe working conditions.

Disadvantages:
- High investment and operating costs.
- Location constraints.

[own source]

Air methods with a helicopter

Advantages:
- Fastest mapping of large areas.
- Good instrumentation.
- Distance protection and radiation shielding solution.
- Wide variety of deploy ability.
- Quick response.
- Despite its speed, it is able to determine relatively accurately.
- It can also be used to assess surface contamination and search for a point source.
- In case of land contamination, there is no need to fear contamination.

Disadvantages:
- Inability to deploy in certain weather conditions.
- High investment and operating costs.
- Qualified staff

[3,4]

[3,4]

Air methods with drones

Advantages:
- Remote control or perform pre-programmed operations.
- It can also be used in areas dangerous to humans.
- Investment and operational costs are relatively low.
- It can be used for both measurement and sampling.

Disadvantages:
- It cannot be used in certain weather conditions..
- Remote control failure.
- Radiation resistance. [1]

[6]

[7]

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