3rd Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Védelem online cooperated with the University of Public Service

26th of April, 2023 Budapest, Hungary

Book of extended abstracts

Védelem Tudomány

Budapest 2023

3rd Fire Engineering & Disaster Management Prerecorded International Scientific Conference

Védelem online – cooperated with the University of Public Service

26th of April, 2023 Budapest, Hungary

Book of extended abstracts

Publisher:
Védelem Tudomány Journal

VÉDELEM TUDOMÁNY
KATASZTRÓFAVÉDELMI ONLINE TUDOMÁNYOS FOLYÓIRAT

Budapest
2023.

Edited by László Bodnár and György Heizler

ISBN: 978-615-01-8104-2

Welcome speech by Brigadier General Dr. Ferenc Varga

Dear colleagues and friends/Ladies and Gentleman,

My name is Brigadier General Dr. Ferenc Varga PhD. I am the head of the Institute of Disaster Management, Faculty of Law Enforcement University of Public Service. I am the chair of the 3rd 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.

In the last three years, mainly due to the Covid-19 Pandemic, the organization of online conferences has become increasingly popular. So it is no longer foreign to us to communicate online, so many events, including scientific conferences, have been organized in this way. For this reason, we are organizing our traditional conference this year also in an online pre-recorded format.

The primary goal of the conference is to present the actual researches in the field of Fire Engineering and Disaster Management. Presentations related to fire protection will dominate the conference, but covering the educational portfolio of the University of Public Service, Faculty of Law Enforcement, and Institute of Disaster Management. There will also be lectures in the topic of Safety and Security developed at the scientific level.

I am pleased to inform you, that we have received video presentations by lecturers and researchers from several universities worldwide. I would like to thank everyone to participate in the conference. I wish you all a very fruitful conference!

Thank you for your attention!

Brigadier-General Dr. Ferenc Varga PhD
Chair of the conference

Scientific Committee

- Ajtai Nicolae - Babes-Bolyai University, Cluj-Napoca, Romania
- Ana Birsan - Moldova State University, Moldova
- Ambrusz József, University of Public Service, Budapest, Hungary
- Balázs György - Budapest University of Technology and Economics, Hungary
- Belle Johannes - University of the Free State, Bloemfontein, South Africa
- Bleszity János, – University of Public Service, Budapest, Hungary
- Bodnár László, University of Public Service, Budapest, Hungary
- Bognár Balázs – National Directorate General for Disaster Management, Ministry of the Interior, KTT, Hungary
- Csurgai József - University of Public Service, Budapest, Hungary
- Das Oisik - The University of Auckland, New Zealand
- Duray Balázs - University of Szeged, Hungary
- Elek Barbara - University of Óbuda, Hungary
- Érces Gergő- University of Public Service, Budapest, Hungary
- Fekete Alexander - TH Köln, Germany
- Feltynowski Mariusz - Main School of Fire Service, Poland
- Finta Viktória - University of Public Service, Budapest, Hungary
- Försth Michael - Luleå University of Technology, Luleå, Sweden
- Gall Anthony - University of Óbuda, Budapest, Hungary
- Gökhan Yazıcı - University of Istambul, Turkey
- Gromek Pawel - Main School of Fire Service, Poland
- Hedenqvist Mikael - KTH Royal Institute of Technology, Sweden
- Hesz József - University of Public Service, Budapest, Hungary
- Hupuczi Júlia - University of Szeged, Hungary
- Jiri Pokorny - Technical University of Ostrava, Czech Republic
- Kacikova Danica - Technical University in Zvolen, Slovakia
- Kamau Jayne - Kenyatta University, Nairobi, Kenya
- Kátai-Urbán Lajos - University of Public Service, Budapest, Hungary
- Kerekes Zsuzsanna - University of Public Service, Budapest, Hungary
- Kostiantyn Afanasenko - National University of Civil Protection, Ukraine
- Kovács Ferenc - Univeristy of Szeged. Hungary
- Kovács Gábor - University of Public Service, Hungary
- Kunguma Olivia – University of the Free Sate DiMTEC, South Africa
- Kuti Rajmund - University of Győr, Hungary
- Lublóy Éva - Budapest University of Technology and Economics, Hungary
- Majlingova Andrea - Technical University in Zvolen, Slovakia
- Mal Reddy - Durban University of Technology, South Africa
- Mikó Edit - University of Szeged, Hungary
- Muhoray Árpád - University of Public Service, Budapest, Hungary
- Ncube Alice - University of the Free State, Bloemfontein, South Africa
- Ogundeji Abiodun – University of the Free Sate DiMTEC, South Africa
- Osvaldova Linda Makovicka - University of Zilina, Slovakia
- Ozunu Alexandru - Babes-Bolyai University, Cluj-Napoca, Romania
- Padányi József – University of Public Service, Budapest, Hungary
- Palik Mátyás – University of Public Service, Budapest, Hungary
- Pántya Péter - University of Public Service, Budapest, Hungary

- Piwowarsky Julius - College of Public and Individual Sec, Poland
- Qubaa Abdalrahman R. - University of Mosul, Iraq
- Rácz Sándor - University of Public Service, Budapest, Hungary
- Radosław Fellner - Main School of Fire Service, Poland
- Rajnai Zoltán - University of Óbuda, Budapest, Hungary
- Restás Ágoston - University of Public Service, Budapest, Hungary
- Sas Gabriel - University of Technology, Luleå, Sweden
- Shwababa Siviwe - Rhodes University, Grahamstown, South Africa
- Sipos György - University of Szeged, Hungary
- Strini Pillay - Durban University of Technology, South Africa
- Svetlík Jozef - University of Zilina, Slovakia
- Szilvássy László – University of Public Service, Budapest, Hungary
- Szűcs László - University of Óbuda, Budapest, Hungary
- Takács Lajos-Budapest University of Technology and Economics, Hungary
- Tandlich Roman - Rhodes University, Grahamstown, South Africa
- Teknős László - University of Public Service, Budapest, Hungary
- Tomasz Zweglinski - Main School of Fire Service, Warsaw, Poland
- Török Zoltán - Babes-Bolyai University, Cluj-Napoca, Romania
- Varga Ferenc - University of Public Service, Budapest, Hungary
- Vass Gyula - University of Public Service, Budapest, Hungary
- Xu Qiang - Nanjing University of Science and Technology, China
- Zachar Martin - Technical University in Zvolen, Slovakia

Organizing Committee

- Ambrusz József - University of Public Service, Budapest, Hungary
- Bodnár László - University of Public Service, Budapest, Hungary
- Érces Gergő - University of Public Service, Budapest, Hungary
- Heizler György - Védelem Tudomány Journal, Hungary
- Hesz József - University of Public Service, Budapest, Hungary
- Horváth Galina - University of Public Service, Budapest, Hungary
- Kátai-Urbán Lajos - University of Public Service, Budapest, Hungary
- Kerekes Zsuzsanna - University of Public Service, Budapest, Hungary
- Kovács Gábor - University of Public Service, Hungary
- Pántya Péter - University of Public Service, Budapest, Hungary
- Rácz Sándor - University of Public Service, Budapest, Hungary
- Restás Ágoston - University of Public Service, Budapest, Hungary
- Varga Ferenc - University of Public Service, Budapest, Hungary
- Vass Gyula - University of Public Service, Budapest, Hungary
- Veresné Rauscher Judit - University of Public Service, Budapest, Hungary

Chair of the conference:
Brigadier General Dr. Ferenc Varga, PhD

Co-chairs of the conference:
Gyula Vass, György Heizler, József Ambrusz, Ágoston Restás

Table of contents

Subsection 3

Chair: Linda Makovicka Osvaldova, Co-chair: László Teknős

1. Levente Lőrincz: Household fires and their prevention.
2. Raphela Tlou: Fire safety management in the artificial intelligence era in developing countries.
3. Benjamin Hozer – Lajos Kátai-Urbán – Réka Magdolna Rácz Kirovné – Ferenc Varga: Fire hazard risks at municipal landfill sites.

Section C – Firefighting and rescue operation management

Subsection 1

Chair: Andrea Majlingova, Co-chair: Péter Pántya

1. Eszter Bognár – Péter Pántya: Volunteer firefighting associations abroad and in Hungary.
2. Anett Dobó: Cooling interventions for firefighters: to increase efficiency and concentration.
3. László Farkas - Sándor Rácz: Examining the physical abilities of firefighters.

Subsection 2

Chair: Danica Kacikova, Co-chair: Sándor Rácz

1. Attila István Fülöp – Péter Pántya: Special use of firefighting vehicles in disaster prevention: Safe use of firefighting cranes, possibilities to promote safety
2. Tamás Igaz-Danszky – Judit Bolgár – József Hesz: The psychological aspects of the work of the Capital Disaster Management's Operation Control Service.
3. Jane Kamau: Cardiorespiratory fitness and body composition of first responders in Murang'a county, Kenya.

Subsection 3

Chair: Pawel Gromek, Co-chair: László Bodnár

1. Yaroslav Kalchenko – Mykhailo Pikalov: Determination of the electrical conductors parameters in the emergency mode of operation.
2. Máté Kovács - Sándor Rácz - Norbert Szél: Developing safe water rescue competences and methodological assessment in youth education.
3. Abdalrahman R. Qubaa - Taha A. AlJawwadi - Lubna M. Saeed - Agoston Restas: UAVs Drones for Vegetation Fire Detection and Monitoring.

Subsection 4

Chair: Ottakar Jirí Mika, Co-chair: Maxims Feofilovs

1. Balázs Tóth– Ágoston Restás: Measuring the sustainability of attention and concentration during firefighting interventions with the pieron test
2. Krisztián Németh: Drone usage in forest fires.
3. József Kersák – Péter Pántya: Technical development opportunities in the field of practical training.

Section D – Disaster management

Subsection 1

Chair: Nicolae Ajtai, Co-chair: Árpád Muhoray

1. Csaba Sándor Almási –Zsolt Cimer – Lajos Kátai-Urbán– Ferenc Varga: The history of the development of international regulations for the transport of dangerous goods by road.
2. Balázs Barina: First response in radiological emergency situations.
3. Ádám Berger – Lajos Kátai-Urbán - Zsolt Cimer: Principles for the outdoor storage of dangerous goods in parcels.

Subsection 2

Chair: Tlou Raphela, Co-chair: Lajos Kátai-Urbán

1. Benda István - József Dobor: Summary of the lithium battery issue from the perspective of first responders
2. Alexander Fekete – Manuel Geiger –Steffen Neuner – Muhammed Bodur Enes: Challenges in adaptation/modification of the German incident command system for hospital disaster management.
3. Tamás Hábermayer – Árpád Muhoray: The activity of urban search and rescue teams and the relationship between asbestos pollution. The Alert Pro 1000 and the WISER software.

Subsection 3

Chair: Zoltán Török, Co-chair: József Ambrusz

1. Maxim Kátai-Urbán – Tibor Bíró– Róbert Révai – Zsolt Cimer: Safety Organization of Dangerous Establishments, with particular regard to the Prevention of Water Pollution.
2. Réka Magdolna Rácz Kirovné: International efforts to reduce disaster risk.
3. Levente Lőricz – Hermina Horváth: Household poisoning accidents and prevention.

Subsection 4

Chair: Olivia Kunguma, Co-chair: Ágnes Jenei

1. Pawel Gromek: Operational risk and epidemic risk reduction
2. László Teknős: Sustainability aspects of disaster management.
3. Örs Vásárhelyi – Dobor József – Ambrusz József: IoT as a tool in achieving Disaster Management purposes.

Section E – Safety and security

Subsection 1

Chair: Alexander Fekete, Co-chair: Emese Belényesi

1. Noémi Kiss – József Dobor: Cyclohexane cloud explosion in Flixborough.
2. Réka Papp – József Dobor: Summary of damage incidents in Balatonfűzfő.
3. Bianka Szarvas – József Dobor: Three Mile Island Nuclear Power Plant-the most famous nuclear accident in the US.

Subsection 2

Chair: Julius Piwowarski Co-chair: Gábor Kovács

1. Karina Gyürü - Georgina Nothartné Viszked – József Ambrusz: The cooperation of the forces involved in flood defense and the possibilities for the development of logistics.
2. Lilla Horváth: Occupational health and safety tasks for the prevention of stress, with particular regard to firefighters.
3. János Petrányi - Lajos Kátai-Urbán - Gyula Vass - Attila Zsitnyányi: The relevance of nuclear measurements in the field of industrial safety.

Subsection 3

Chair: Johannes Belle, Co-chair: Alice Ncube

1. Dávid Petrétei: The IAAI – the International Association of Arson Investigators
2. Iván Sibalin - Lajos Kátai-Urbán - Zsolt Cimer: Research and development of industrial safety-activities related to the operation of energy systems.
3. Péter Tomka: Thermal imaging cameras in firefighting and disaster management operations.

Subsection 4

Chair: Roman Tandlich, Co-chair: Johanna Farkas

1. András Kristóf Kozma – László Bodnár: The Flood of Szombathely and the PTS-M amphibious Soviet tank.
2. Balázs Tóth: In some damage cases, the subjective performance of firefighters based on load.
3. Zoltán Szilcsanov: Significant changes in NATO Civil Emergency Planning and the issue of resilience.
4. Bence Lakatos – Gyula Vass – László Teknős: Examining the possibilities for further development of the authorities tasks of disaster management.

Short bio sketches about the authors and presenters of the conference

Chair and Co-chairs of the conference

Ferenc Varga (Chair of the conference)

Fire brigadier General, Ferenc Varga PhD, fire protection engineer, assistant professor. Head of the Institute of Disaster Management of Faculty of Law Enforcement, University of Public Service (UPS), Budapest, Hungary. He holds a PhD degree in Military Engineering from the University of Public Service (2019). His research interests are in the field of disaster management and fire protection. Since 1986, he provided various management positions at the Budapest Directorate of Disaster Management. Since 2023, he has been the head of the Institute of Disaster Management (UPS). He has several decades of experience in management, having previously headed the Budapest Disaster Management Directorate. His current research field is military engineering. He is the author of numerous scientific publications.

Gyula Vass (Co-chair of the conference)

Vass Gyula was born in 1957. He has been leading the Institute of Disaster Management since 2017. Colonel Dr. Vass has master's degrees in civil engineer (1991) and fire engineering (1986). He defended his PhD thesis in the field of military sciences, disaster management in 2006 at the Zrínyi Miklós National Defence University. In 2016 he habilitated at Ludovika-UPS and from 2017, he is full-time associate professor. He has positions at Fire and Disaster Management organisations as a firefighter, fire prevention officer, industrial safety expert and different fire chiefs. He is a member of the Scientific Council for Disaster Management, the Technical Scientific Section for Nuclear Accident Prevention and the Nuclear Energy Certification Commission.

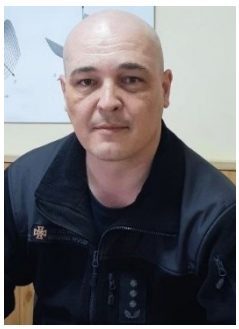
József Ambrusz (Co-chair of the conference)

Ambrusz József (PhD) - COL (Fire Service) József Ambrusz, Assistant Professor of the Institute of Disaster Management, University of Public Service, Acting Head of the Department of Disaster Management Operations. His studies are diverse, in 1993, he graduated from the Lajos Kossuth Military Academy with a degree in border guarding and boarding school pedagogy. In 1997, he obtained a certified degree in human resource management at the Budapest University of Economics. In 2014, he received a certified MSc degree in Defence Administration Manager at the University of Public Service. In 2019, he obtained a PhD degree at the Doctoral School of Military Engineering, University of Public Service with his thesis titled "Elimination of the Consequences of Disasters and the Possible Solutions of the Management, Command and Control of Engineering Tasks of Rehabilitation and Reconstruction".

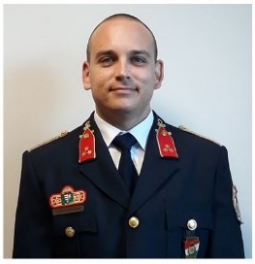
Ágoston Restás (Co-chair of the conference)

Ágoston Restás (Eng., ret. Firefighter Lt. Colonel) habilitated associate professor at the National University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, head of the Department of Fire Protection and Rescue Operation Management. Restas holds mechanical engineering (1988), economist (1999) and disaster manager (2002) degrees. In 2008 Restás made his PhD thesis at the Miklós Zrínyi National Defense University, titled "Research and development of the aerial reconnaissance and extinguishing of forest fires". In 2013 Restas prepared his other PhD thesis at the Corvinus University of Budapest, titled "Decision-making of firefighting managers in emergencies". Habilitation was also passed in 2015 at the National University of Public Service, Budapest.

Authors and presenters of the conference



Afanasenko Kostiantyn, born on December 20, 1981. Candidate of Technical Sciences, Associated Professor, Deputy Head of the Department of Fire and Technogenic Safety of Objects and Technologies, Colonel of the Civil Defense Service, National University of Civil Protection of Ukraine, Kharkiv. Born in Kharkiv, Ukraine. Graduated from the Academy of Fire Safety of Ukraine in 2004 and completed a master`s degree. Since 2009, he has been engaged in scientific and pedagogical activities. In 2017, defended his thesis on the specialty 21.06.02 "Fire Safety" and earned a scientific degree of Candidate of Technical Sciences. In 2019 awarded a scientific title of Associate Professor of the Department of Fire and Technogenic Safety of Objects and Technologies at the Faculty of Fire Safety.



Almasi Csaba was born on 23rd of November 1985 in Kecskemét. He has been working as a CBRN Reconnaissance Officer dealing with administration system of hazardous materials. He has experience in intervening and investigating needed to be accomplished at accidents occurring in transport or in dangerous establishments and involving dangerous goods and hazardous materials. He also has an experience in authority work supervising of all means of transport carrying dangerous goods. Almási has a BSc degree in agriculture engineering and an MA degree in disaster management. He began his PhD studies at the Doctoral School of Military Engineering at the University of Public Service in 2020, where he is currently an assistant lecturer as well. His research topic is "Investigation Procedure at Road Accidents Involving Dangerous Goods." The expected time for his thesis defence is spring 2024.

Barina Balázs József was born on November 3, 1983, I live in the city of Tolna. My parents are both kayak - canoe coaches and teachers. Following their example, I also started kayaking, which filled my daily life for more than twenty years. I won medals at world and european competitions, I closed my sport's career as an national team athlete. I have been working as a firefighter since 2010 in the at the time one and only nuclear power plant in Hungary. During my service, I completed mandatory power plant courses and apart of them I acquired the Bsc degree in Fire Protection and Rescue Management at the National Civil Service University and I completed the University's Master's Degree in Disaster Management. Thanks to my studies, I have been in the position of officer for the third year. As unit leader, I consider the effective protection of the lives and health of the first responders to be my primary

objective. I am currently a first year doctoral student at the Doctoral School of Military Engineering at the University of Public Service.

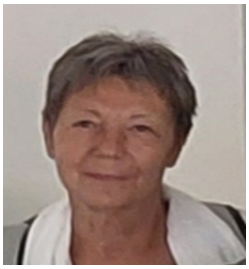
Benda István, hasbeen a professional firefighter for more than 15 years, currently I am a driver at the Budapest Fire Brigade, in the XI District Professional Fire Brigade.

Berger Ádám is an engineer at the Department of Water and Environmental Security of the University of Public Service. In the course of his work, he examines the spread of dangerous substances in water and in soil. Nowadays he is a doctoral student at the Doctoral School of Military Engineering of University of Public Services. His field of research is Disaster Management. The topic of his research is about the resistance developed by dangerous materials to remediation boards and large artefacts against the irreversible effects of accidents.

Bodnár László was born on 31 of January 1992 in Budapest. He began his studies in 2010 at the University of Public Service and obtained the BSc degree in defence administration as a Defence Administration Organizer and in 2016 the MSc degree in defence administration as a Defence Administration Manager. He began his PhD studies in 2016 at the Doctoral School of Military Engineering at the University of Public Service and defended his thesis in 2021. He is currently an assistant lecturer at the National Directorate General for Disaster Management, who works at the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service. His research topics are wildfires, firefighting and fires at Wildland-urban interface.

Bodur Enes Muhammed is also research assistant at the Cologne University of Applied Sciences. He has a bachelor's degree in Rescue Engineering. He works in the field of critical infrastructures and focuses on the resilience of health care facilities. He has gained work experience as volunteer firefighter in Cologne.

Bognár Eszter is 20 years old, studying at the University of Public Service majoring at disaster management. Presently she is in her second year specializing Fire Prevention and Rescue Control. She will get her university degree in 2024. She is particularly interested in rescue and fire protection, in the future she would like to conduct research in this topic.



Bolgár Judit dr. CSc. ret.colonel, professor emerita University of Public Service (NUPS) Faculty of Military Sciences and Officer Training (primary email: bolgar.judit@uni-nke.hu) HDI consultant, and KMDI instructor. Qualifications: mechanical engineer (BME) engineer teacher (BME), psychologist (ELTE) clinical academic specialisation psychologist (HIETE). She takes part in the military and policy science high education since 1990. His researchers' activity is connected to the applied psychology. Her more important research area: Special (danger) psychology; the psychological effects of danger situations; stress effects and PTSD; leadership and organization psychology (primarily psychic suitabi lity, competence, resilience and organizational culture).

Cimer Zsolt is a chemical engineer, engineer-economist, fire protection engineer and associate professor. He is the vice dean of the Faculty of Water Science at the University of Public Service in Hungary. His research specialization is defence design, industrial safety, explosion protection and risk analysis.

Dobo Anett firefighter lieutenant was born on 14 of August 1990 in Vác. She began her studies in 2009 at the Miklós Zrínyi National Defence University obtained the BSc degree in defence administration as a a Defence Administration Organizer and in 2014 at the University of Public Service the MSc degree in defence administration as a Defence Administration Manager, disaster specialization. She began her PhD studies in 2014 at the Doctoral School of Military Engineering at the University of Public Service. Now she is working at the The Pest County Directorate of Disaster Recovery Vác Sub-office. She is also a PhD Candidate. Her research topic is Health and Safety and the raising of the efficiency of the fire organisations at the incidents.

Dobor József is an associate professorat the University of Public Service, Institute of Disaster Management, Department of Industrial Safety. Education: 2006 Eötvös Loránd University, Faculty of Science, MA in Chemistry; 2011 Eötvös Loránd University, Doctoral School of Environmental Sciences, Environmental Chemistry, PhD; 2018 University of Public Service, Diploma in Disaster Management, MA. Degrees: 2012, PhD, Eötvös Loránd University, Faculty of Science; 2018, habil. doc., University of Public Service. Assistant lecturer (2012-2013), senior lecturer (2013-2018), associate professor (2018-). Research areas: chemistry, chemical-biological-radiological damage detection, radiation protection, detection of industrial damage events, industrial safety. Address: Hungary, 1101 Budapest, Hungária krt. 9-11. Nationality: Hungarian, Email: dobor.jozsef@uni-nke.hu

Edelmann Dóra

affiliation: Óbudai University - Doctoral School on Safety and Security Sciences
research area: mass movements, crowd motion models, mass safety
education:
Fire Protection Engineer, Budapest University of Technology and Economics
MsC Civil Engineer, Budapest University of Technology and Economics
occupation: engineering and technical consulting, interior design
community engagement: volunteer, Hungarian Red Cross

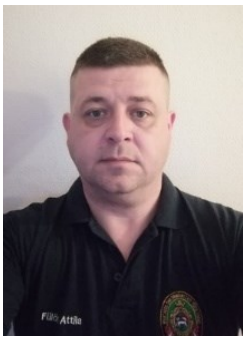
Érces Gergő is an architect, fire protection engineer, University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management, associate professor. After obtaining an MSc degree in architecture from the Budapest University of Technology and Economics in 2009, he received a fire protection engineering certificate in 2011 at the Ybl Miklós Faculty of Architecture of Szent István University. In the field of technical sciences, he obtained a PhD academic degree in 2019 at the Doctoral School of Military Engineering at the University of Public Service. His career started as a professional firefighter at the Budapest Fire Department in 2010, where he worked in the field of fire investigation and from 2012 he worked at the Capital Disaster Management Directorate in the field of fire prevention. Since 2017 he has been a lecturer in fire prevention courses at the Department of Fire Protection and Rescue Operations Management of the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service. At the university, he works as a research engineer in the field of disaster management and fire prevention. In 2022 he became the head of the Department of Fire Engineering.

Farkas Johanna is an emergency psychologist, hypnotherapist with 20 years of work experience. I have a part-time job and a full-time job. My part-time job is related to education. I work as an Associate Professor for the University of Public Service at the Faculty of Law Enforcement at the Department of Criminal Psychology, I mainly train police officers. My full-time job is in the biggest Hungarian Children Hospital (called Heim Pál Pediatric Hospital), where I am the Head of the Department of Forensic Psychiatry. Our department is designed for the treatment of outpatients (e.g. youth psychopathy, deviant behaviour, etc.) and inpatients (e.g. suicide, psychosis, self-defeating behaviour) associated (or not) with antisocial behaviour. Our hospital is the only one in Hungary that treats patients (children and youth) with mental disorders and they are sometimes juvenile offenders (therefore, we often meet with police officers. My main areas of interest are criminal psychology and mental disorders.

Farkas László was born on 21 December 1977 in Budapest. After elementary school, he graduated from Csanádi Árpád High School in Budapest in 1996. From 1996 to 2002, he attended the University of Physical Education and graduated there as a physical education teacher and trainer. From 2002 to 2010, he worked for several associations as a specialist coach. Since 2010, he has been working at the Budapest Disaster Management Directorate as a firefighter, first as a subordinate, and since 2012 as a platoon commander. He is currently a student at the Faculty of Law Enforcement of the University of Public Service at the Institute of Disaster Management, specializing in the fire protection and rescue operations management.

Fekete Alexander is Professor of Risk and Crisis Management at the Cologne University of Applied Sciences. He works in the field of security research on natural hazards such as floods, earthquakes, or landslides. His research focuses on their impact on affected persons, but also on power and supply chain failures. He has gained work experience at universities, the United Nations and the Federal Office of Civil Protection and Disaster Assistance.

Fodor Máté was born on 13 December 1990 in Salgótarján. He joined the Salgótarján Fire Brigade in 2013 as a firefighter. He started his studies at the University of Public Service in 2020, BA in Disaster Management, specializing in Fire Protection and Rescue Operations Management. Currently, he is the Operations Control Officer of the Nógrád County Operations Management. His main topic is the situation of the first-aid skills of firefighters in the operational area and the possibilities of its improvement. Orcid: 0009-0008-9404-9441.



Fülöp István Attila staff sergeant, E-mail: fulopameister@gmail.com
My name is Attila Fülöp, I was appointed to the Metropolitan Fire Department in 2004 in to the XIII. district fire department. I started my studies at the primary school for fire fighters of the BM KOK. In 2013, I was admitted to the BM KOK service command school. I am currently studying fire protection and rescue management at the University of Public Service.

Geiger Manuel is Research Assistant at the Cologne University of Applied Sciences and a medical student at the University of Bonn. He has a master's degree in safety engineering and is specialized on critical infrastructures, especially health care facilities and drinking water supply. He has gained work experience in fire engineering and international experiences as volunteer at the German Federal Agency for Technical Relief (THW) in the INSARAG Heavy Urban Search and Rescue Team.

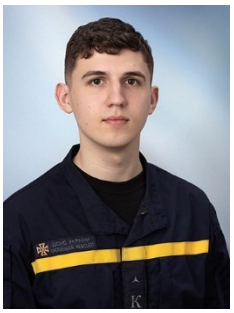
Gromek Pawel Maj., DSc Eng. serves as associate professor at the Institute of Internal Security at The Main School of Fire Service in Warsaw (Poland) (SGSP) and officer of the State Fire Service of the Republic of Poland. He was Deputy-Dean of Faculty of Civil Safety Engineering at SGSP (2016-2019) and Deputy-Rector for Science and Education at SGSP (2019-2020). He holds an M.S. in Fire Safety Engineering (Engineering Studies) from the Main School of Fire Service in Warsaw, Poland, a PhD in Security Studies (Social Sciences) from the National Defense Academy in Warsaw, Poland, and a Doctorate of Science in Security Studies (Social Sciences) from The War Art Academy in Warsaw, Poland. He completed post-graduate studies in occupational safety and health at Warsaw University of Technology, Warsaw, Poland, and post-graduate studies in pedagogics for teachers at Warsaw University of Life Sciences, Warsaw, Poland. Maj. Gromek is expert in European Research Executive Agency and the Government Centre for Security (Poland). He has researched and published in several areas of security including disaster risk reduction, crisis management, homeland security and infrastructure resilience. He is married and has three great daughters.

Gyöngyössy Éva was born on 13 May 1992 in Budapest, Hungary. Her higher education began in 2010 at Szent István University, Ybl Miklós Faculty of Architecture and Civil Engineering, where she got her Bsc degree as Civil Engineer, in Fire Protection and Disaster Prevention specialisation. She has started her research in connection with electric cables in her Bsc thesis. During her studies, she completed the volunteer firefighter course, and she was member of a voluntary disaster prevention organization. She continued her studies at Szent István University in 2017, and she obtained the Msc degree as Construction Engineer, in Fire Protection specialisation. Her Msc thesis subject was in connection with design of fire alarm system in potentially explosive atmospheres. In 2019, she has started to work at Schrack Seconet Kft., as Junior designer of Fire Alarm Systems, where she has earned experience of large national projects. She decided to continue her studies in aim to expand her knowledge in 2022, at National University of Public Service, Hungary, at Doctoral School of Military Engineering. As continue her Bsc research, her research topic is fire protection of electric cables. The expected time of finish of her PhD studies in 2026.

Gyürü Karina was born on 22 of October 1997 in Csorna. She is a firefighter since 2016 in Kapuvár. She started her studies at the University of Public Service, in disaster management as a BA student. She graduated as a Disaster Management Organizer in Disaster Management Operations. Since 2021, she has been a master's student in Disaster Management at the University of Public Service. She currently works in the Fire Prevention Department in Kapuvár's Disaster Management Office. Her

research area is on-site management of protection and cooperation in flood protection.

Hábermayer Tamás began his career on August 20, 2002 in the Szentendre Barracks of the Hungarian Armed Forces, after graduating from the Kossuth Lajos Faculty of Military Sciences of the Zrínyi Miklós University of National Defense as an artillery officer and lieutenant. He gained military peacekeeping experience in 2004 when he held a liaison position in the Central - South Multinational Division - Hungarian Logistics Transport Battalion in Iraq. After completing various responsible military positions (trainer, deputy squadron commander), he was transferred from the Hungarian Armed Forces to the Disaster Management staff at his request.
On 1 March 2007, he was appointed to the position of Head of the Civil Protection Branch Office of the Bács–Kiskun County Disaster Management Directorate, which he held until 31 December 2011. During this period, he took part in the protection against the 2010 floods in Felsőzsolca and the red sludge disaster, where he served as rescue and coordination commander.
He developed his professional knowledge by obtaining the master degree of disaster management civil protection organizer, passing a law enforcement professional examination and passing a law enforcement master's examination. In addition, in order to expand his legal knowledge, he graduated from the University of Szeged, Faculty of Law. From 1 January 2012 to 30 June 2013, he held the position of Deputy Commander of the Kalocsa Professional Fire Brigade of the Bács-Kiskun County Disaster Management Directorate. During the 2013 Danube flood, he worked as a defense manager on the Solt - Harta - Dunapataj defense line. From 1 July 2013 to 21 December 2014, he was the Deputy Inspector General of Civil Protection of the National Directorate General for Disaster Management of the Ministry of the Interior. As of December 22, 2014, he is currently the Deputy Director of the Tolna County Disaster Management Directorate. As head, he is responsible for the general replacement of the director and for the professional management of the fire, civil protection, industrial security and integrated official work. He is married, father of two sons.

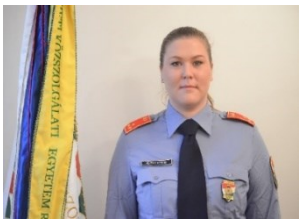


Harkavyi Andrii, born on April 8, 2003. Studied at the Myrhorod specialized secondary school № 5 with an in-depth study of the English language. In 2020, Andrii graduated from the specialized school and enrolled in a Higher Military Educational Institution, namely the National University of Civil Protection of Ukraine, specializing in "Fire Safety". Currently, at the moment studying in the 3rd year of the "Fire Safety" faculty.

Hesz József is an associate professor at University of Public Service, Institute of Disaster Management, Department of Fire Protection and Rescue Operations Management. He works at the National Directorate General for Disaster Management of the Ministry of the Interior. His research interests are: disaster management, fire protection, firefighting operations management.

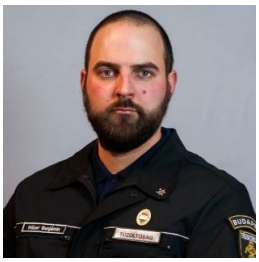
Hodálik Marek began his higher education in 2015 at the Technical University in Zvolen at the Department of Fire Protection (BSc. degree topic - forest fires). In 2020 he obtained an MSc. degree in fire safety sciences at the Department of Fire Protection (MSc. degree topic - arson fires). He has begun PhD. Studies in 2020 at the Technical University in Zvolen (PhD. Topic: Application of progressive laboratory method for determination of fire accelerators). His main research topics are changes in fire technical parameters by progressive analytical forensic methods, fire investigation, generation and spread of smoke during fires, fire chemistry. He has certificates and courses: Fire protection technician, civil protection technician, advanced first aid course. He is currently a full-time doctoral student at the Department of Fire Protection.

Holczer Gyula Kristóf
Affiliation: Firefighter – Győr Fire Department
Firefighter since 2018, He started his university studies in 2020 at the University of Public Service, majoring in Fire Protection and Rescue Operations Management.
E-mail: holczer9797@gmail.com



Horváth Hermina is an assistant lecturer at the National Directorate General for Disaster Management, who works at the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service since 2012. She was born on 17 of April 1988 in Szekszárd. She began her studies in 2006 at the Miklós Zrínyi National Defence University obtained the BSc degree in defence administration as a defence administration officer and in 2009 the MSc degree in defence administration as a defence administration manager, disaster specialization. She began her PhD studies in 2013 at the Doctoral School of Military Engineering at the University of Public Service. Her research topic is emergency planning at railway marshalling yards, and dangerous goods transportation. She is also has a certificate of training as safety adviser for the transport of dangerous goods by road, rail and inland waterway. In addition she is the secretary at Scientific Students Association at the Faculty of Law Enforcement at UPS. She received the excellent lecturer title of the Institute in 2017.

Horváth Lilla began her higher education in 2007 at Faculty of Bioengineering at Budapest University Of Technology and Economics. In 2013 she obtained an Msc degree in bioengineering and 2014 in Health and Safety Engineering. She has begun her PhD studies in 2021 at the Doctoral School of Military Engineering at the University of Public Service. She is currently a Health and Safety specialist at the National Directorate General for Disaster Management.



Hózer Benjámin started his carrer as a volunteer fireman, back in 2013. Served as a volunteer fireman in Pest County and completed the volunteer squad leader course in 2014. Later graduated in a 'Hazardous Industrial Safety Administrator' course and a 'Fire Safety Coordinator' course also. Started the bachelor's degree in 2016 at UPS as disaster manager in industrial safety specialisation. Graduated in 2019 at Ba. and started Ma. course in the same year. Started Doctoral School of Military Engineering in 2021. Part-time lecturer since 2022. Private collector since 2013. Also doing work in fire history research, publication and exhibitions.

Igaz-Danszky Tamás is a 1st year doctoral student at the University of Public Service, Doctoral School of Military Engineering, employee of the Capital Directorate for Disaster Management, Operation Control Service. His research interests focus on the development of operation control service as a part of Disaster Management. He has been working for the Disaster Management for 16 years of which he has spent 12 years in Operation Control Service, until the present. In 2020 he graduate with an Msc degree in"Certified Disaster Manager"
at the University of Public Service.

Jambrik Rudolf– Ret. Firefighter Colonel
E-mail: jambrikr@gmail.com
Professional firefighter between 1976 and 2019.
BM TTK (Firefighting and Damage Prevention) - Gyula Juhász Teacher Training College in Szeged, Pedagogy
Firefighter until 2009 (85-2009 Firefighting Group)2009 Budapest Ferenc Liszt International Airport Fire Department - Branch Manager

Kalchenko Yaroslav is born on 21.06.1993, a major of the Civil Defense Service, be in the position of senior lecturer of the department, PhD. Was born in Berdyansk, Ukraine. In 2010 graduated from the National University of Civil Defense of Ukraine. In 2020, he obtained the scientific degree of Doctor of Philosophy in the specialty "Fire Safety". The number of articles in the national database – 29. The number of articles in international databases – 16.

Kamau Wanjiku Jane is a senior lecturer in the School of Public Health and Applied Human Sciences, Department of Physical Education, Exercise and Sports Science, Kenyatta University, Kenya. She is the immediate former chairperson of the department and director, Kenyatta University Community Outreach and Extension Programmes. She lectures in the Department of Physical Education, Exercise and Sports Science specializing in human physiology, Exercise physiology, and sports biomechanics. Dr. Kamau is a member of the Kenyatta University Ethical Review Board and The Kenyatta University wellness board. Her area of specialization is Applied Exercise physiology with special research interest in Use of Exercise in Prevention and Management of NCDs.

Ing. dr. jur. **Kátai-Urbán Lajos** PhD (1969): Colonel of fire protection, associate professor, head of Department for Industrial Safety for the Institute of Disaster Management, at the University of Public Service (UPS), Budapest, Hungary. He is responsible for the establishment and development of the industrial safety's higher education system within the institution. He has been working for 14 years in the field of the prevention of industrial and transport accidents at the National Disaster Management Authority in Hungary. He was elected as a deputy chair of the UN ECE Industrial Accident Convention between 2004-2008. He obtained a Ph.D degree in military technical sciences (2005) at Zrínyi Miklós Defence University and habilitation degree (2015) at UPS, Budapest.

Kerekes Zsuzsanna was born 1958 in Budapest. She began her hight studies in 1976 at the Pannon University in Veszprém, and obtained the MSc degree in chemical engineering, silicate chemistry specialization. She began her dr.univ studies in 1981 at the Doctoral School of Budapest University of Technology Faculty of Chemical Technology and Biotechnology. She has been an university lecturer since 1999-2020 at Ybl Miklós Faculty of Architecture and Civil Engineering Fire-safety Engineering Óbuda University as fire protection laboratory leader. She obtained a PhD degree in 2015 and habil degree in 2019. Instructor since 2019 at the University of Public Service. She has been working in her profession for 40 years in various fields: material structure research,

ceramics, glass, analytics. Her research topic is "research and development combustion mechanism of non-combustible and combustible materials.

Kersák József Zsolt was born on April 21, 1976 in Pincehely. He has been working as a professional firefighter since 2000, his current position as deputy commander. He studied in Keszthely in 2011 as an agricultural engineer for economic and rural development. He started as a disaster management organizer at the University of Public Service in 2013, graduating in 2019 as a disaster management manager (MSc). From 2019 he is a PhD student at the University of Public Service Doctoral School of Military Engineering. His research topic is „The task of the German civil defense is to analyze its equipment system and technical capabilities, and to examine its adaptation possibilities".His other research area "Technical development of rescue fire protection". The expected time for his thesis defence is spring 2023.

Kirovné Rácz Réka Magdolna is a lecturer at University of Public Service, Institute of Disaster Management, Department of Disaster Management Operations.
Her studies: Miklós Zrínyi National Defence University, defense administrative manager (2008), Doctoral School of Military Science (2015).
Her research areas: extreme weather events, climate change, disaster management tasks of the local governments.

Kiss Noémi Noémi Kiss is a second year Master's student in Disaster Management at the University of Public Service; University of Public Service; Institute of Disaster Management.

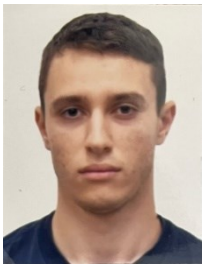
Kovács Máté was born on 16.10.1994 in Kaposvár. I continued my high school studies at the Munkácsy Mihály High School in Kaposvár, where I met the leader of the "KÖTÉL" Association during an interview in 2009. After the interview, I joined the association, where I had the opportunity to learn about both firefighting and water rescue. I obtained my first diving qualification through the association in 2009 and since then I have been actively involved in the search for missing persons in distress in the water. I was a founding member of the Somogy Rescue Group, established in 2011, and of the HUSZÁR rescue organisation, established in 2012. During my volunteer years, I have participated in dozens of water rescue incidents, including missing person search, flood rescue, object search. After moving to Budapest in 2017, in 2019, I had the opportunity to join the diving service of the Budapest Fire and Rescue Directorate as a firefighter diver, where I am currently a driver (diver). In the meantime, I have obtained additional diving qualifications. My highest current qualifications are advanced rescue diver, nitrox

diver and I am in the process of obtaining the dive master (dive leader) qualification.

Kozma András was born on 4 of June 2002. He is studying at the University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management. Presently he is in his second year specializing for Industrial Safety. He will get his university degree in 2024. He wants to continue his studies at the university in the future. His research is about the Flood of Szombathely and the amphibious vechiles.

Muchiri Bilha W. is a civil servant working with Murang'a County Government as the Chief Fire and Disaster Management officer. She is trained on firefighting, fire prevention, leadership management in the fire service, training and supervisory management. She heads the Fire Services and Disaster Management Unit in the County. M/s Bilha is currently the treasurer for the Chief fire Officers Association of Kenya (CFOA-K) and a board member for Kenya Road Cross, Murang'a. Since fire investigation is domiciled in her office, she has a special interest in firefighting and investigation with special focus on evidence protection and collection.

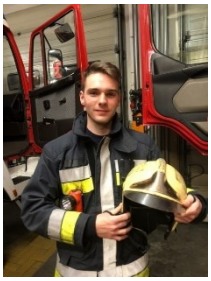
Muhoray Árpád PhD is a retired major general of civil protection, honorary university professor of University of Public Service. He graduated in the Military Academy of Armoured Troops Malinovszkij Rogyion Jakovlevics in former Soviet Union, in Moscow, his university degree is tank engineer. He served 25 years for the Hungarian Army, he was the commander garrison of town Zalaegerszeg. After the Army Mr. Muhoray joined the Hungarian Civil Protection, he was appointed to the county director of HDM in county Zala in 2000. Between 2002 and 2010 he was the Deputy Director General for Emergency Management of NDGDM, and commander of Operational Staff of Governmental Coordination Committee. Between 2010 and 2011 he was the director of Disaster Management Training Centre of NDGDM and in 2012- an assistant university professor of UPS in Institute of Disaster Management. Since 2020 honorary university professor. Mr. Muhoray obtained his PhD degree at the National Defence University in Budapest. He made several researches in the Hungarian Disaster Management on country and county level.



Németh Krisztián is 23 years old daytime and a graduating student at the University of Public Services. He was born in the County of Borsod-Abaúj-Zemplén, in the city of Ózd. He graduated in Széchenyi István Katolikus Közgazdasági Szakközép Iskola, which is a high school of economics. In this school he had language education in two languages (english and german). He got to know the basics of the operation of the economy and the obtainable financial administrator and project management subspecialty qualifications. Although he acquired complex disaster prevention knowledge during the university, he mainly became interested in the firefighter's job, tools and their responsibilities. His current goal is to get his drone license and he wants to do the master's degree at the same university.

Neuner Steffen is Research Assistant at the Cologne University of Applied Sciences. He has a bachelor's degree in Rescue Engineering. He works in the field of critical infrastructures. He focuses on the resilience of health care facilities. He has gained work experience at the German Federal Agency for Technical Relief (THW).

Nothartné Viszked Georgina was born on 2th of August in Szombathely. She is a firefighter lieutenant since 2019. She started her studies at the University of Public Service, in disaster management as a BA student. She graduated as a Disaster Management Organizer in Disaster Management Operations in 2019, then in 2022 she graduated as a Disaster Management Leader in Disaster Managemant at the University of Public Service. She works in the Fire Station in Esztergom as a disaster management officer. Her research area is force majeure events in disaster management and disaster preparedness.



Lőrincz Levente Zoltán was born in 2000 in Tolna County. He is currently a second-year student at the University of Public Service, specializing in industrial safety. He decided on his own to work in the field of disaster management, there was no example in his family before that someone chose the life in uniform. As soon as he got here and started his studies, he wanted to apply as soon as possible to a local volunteer fire brigade, because that's what he is really interested in and that is what really made him choose it. He really enjoys spending his time with the fire brigade and working with them on different incidents. It gives him a lot of inspiration for his plans.

Lypovyi Volodymyr, born on December 26, 1978, Candidate of Technical Sciences, Associated Professor, Associated Professor of the Department National University of Civil Protection of Ukraine, Kharkiv. Born in Kharkiv, Ukraine. Graduated from the Academy of Fire Safety in Ukraine in 2002 and completed a master's degree in management at the National University of Civil Defense of Ukraine in 2011. In 2016, defended a dissertation in the field of "Environmental Safety" and earned a scientific degree of Candidate of Technical Sciences. Completed an internship at the Technological School in Kotowice, Poland, and was awarded the title of Associate Professor in the Department of Fire and Technogenic Safety of Objects and Technologies at the Faculty of Fire Safety. Has 2 utility model patents, 41 publications, including 38 scientific and 3 educational-methodical works, including scientific papers published in national and international peer-reviewed professional journals. Also has 6 publications in journals included in the Scopus bibliographic database. Teaches the course "Fire Safety of Technological Processes" for higher education students.

Oliinik Volodymyr Viktorovich, born on September 28, 1973, a colonel of the civil defense service, is the head of the department of fire and technogenic safety of facilities and technologies National university of Civil Defence of Ukraine, Kharkiv, candidate of technical sciences, associate professor. Born in Dniprodzerzhinsk, Dnipropetrovsk region, Ukraine. Since 1997, he has been engaged in scientific and pedagogical activities at the National University of Civil Defense of Ukraine. In 2000, after completing the adjunct position, he defended his thesis for the degree of Candidate of Technical Sciences in the specialty "Fire Safety". In 2005, he received the academic title of associate professor of the department of fire prevention of production technological processes. He is the author of more than 120 scientific publications.

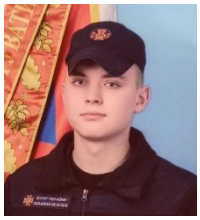
Pántya Péter began his studies in 2003 at the Tessedik Sámuel College (BSc degree in human affairs) later continue at the Miklós Zrínyi National Defence University (MSc an BSc) for Defence Administration Organizer (Disaster Management, Fire Protection and Firefighter) He began his PhD studies in 2008 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 also has a habilitation. His research topics are: fire and disaster management activities, technical equipment, and the raising of the efficiency of the fire organisations at the incidents.

Papp Réka is is 21 years old, studying at the University of Public Service majoring at disaster management. Presently she is in her second year specializing Industrial Safety. She will graduate from college in 2024. She will apply for the master's program the same year because she plans to continue her studies there.

Petretei David, is a police major, graduated as a lawyer and started his police career in 2006 as a crime scene investigator. Recently works at the University of Public Service, Budapest, in the Faculty of Law Enforcement, Department of Forensic Science, as an assistant professor.
Chair of the Scene of Crime Expert Working Group of ENFSI (European Network of Forensic Science Institutes). .

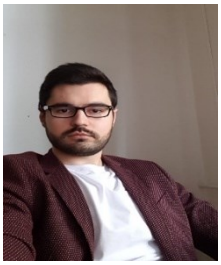
Petrányi Tamás János, graduated from the Budapest University of Technology and Economics with a degree in electrical engineering, and later from the Óbuda University, Keleti Károly Faculty of Business and Management, expert engineering management. In the course of his work, he received an upper-level degree of radiation protection. He is a radiation protection expert in the field of nuclear energy and a full member of the Hungarian Chamber of Engineers as an independent technical expert. He received his PhD degree at the Doctoral School of Military Engineering of the National University of Public Service, Budapest. His research area is ionising radiation measurement. He has an intermediate "C" type language exam in English and German. He started his professional career at the Technical University of Munich in 2002 as a programmer, and after a stay abroad for almost a year, he worked at GAMMA Technical Corporation as a research and development engineer. He has been working for the same company ever since, in different positions. He served in the positions of technical director, head of the nuclear division and eventually director of R&D. In recognition of his professional work, in 2015 he was elected to the management board of the Radiation Protection Section of the Eötvös Loránd Physical Society. He has been a member of the editorial board of the online magazine "RADIATION PROTECTION" ever since. In 2016, he won the Radiation Protection Award for Excellence. He has been elected to be the congress president of the sixth European International Radiation Protection Association (IRPA) Congress in 2022. Since 2023 he is lecturer at the National University of Public Service. He regularly publishes in domestic and foreign professional journals, participates and gives lectures at conferences and congresses. As an industry consultant, he was involved in the creation of several MSc and BSc dissertations, as well as reviewing several dissertations. Thanks to his work, several disaster management and military equipment and devices were created, which are still actively used.

Pikalov Mykhailo is born on 06.05.2004, a private in the Civil Defense Service. I am born in Kharkiv, Ukraine. In 2021, entered into the National University of Civil Defense of Ukraine, where nowadays I have been studying in the second course.



Rácz Sándor was born on 11 of April 1973 in Nyírbátor. He began his studies in 2010 at the University of Public Service and obtained the BSc degree in defence administration as a Defence Administration Organizer and after that the MSc degree in defence administration as a Defence Administration Manager. He began his PhD studies in 2015 at the Doctoral School of Military Engineering at the University of Public Service. He received his scientific degree in 2019. He is currently an assistant professor at the National Directorate General for Disaster Management, who works at the Institute of Disaster Management of the Faculty of Law Enforcement at the University of Public Service. He also worked at the Municipal Fire Department of Budapest and at the Professional Fire Department of Budapest District IX as a Deputy Commander.

Sibalin Ivan is a lawyer and international relations expert at the Prime Minister's Office. He is a graduated PhD student at the Doctoral School of Military Engineering of University of Public Services. His field of research is Disaster Management. The topic of his research is about the strategic issues of industrial safety activities related to the sustainable operation of energy systems.



Slavhorodska Olesya Serhiyivna, born on September 16, 2003, cadet of the fire safety faculty of the National University of Civil Defence of Ukraine.
She was born in Druzhkivka, Donetsk region, Ukraine. Since 2020, she has been engaged in scientific activities at the department of fire and technogenic safety of objects and technologies. She is the author of 4 scientific publications.

Szarvas Bianka is 21 years old, studying at the University of Public Service, Faculty of Law Enforcement, Institute of Disaster Management. Presently she is in her second year specializing for Industrial Safety. She will get her university degree in 2024. She wants to continue her study at the university in the future.

Szél Norbert was born in 1977 in Kecskemét, Hungary. After high school, I finished at University of Pécs, where I attained a degree as a Physical Education Teacher. Starting from a young age, more precisely since 1994 I have worked as a lifeguard while since 1998 I have worked as a lifeguard coach. And in 2008 I have obtained an international lifeguard coach certificate (ILS). I joined the metropolitan Fire Department in 2008, as a firefighter and diver/underwater firefighter, then I became the

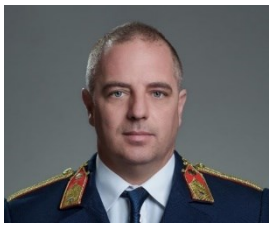
diving leader of the diver section/diving department. I participated in the organization of HUNOR (Hungarian National Organization For Rescue Services) back in 2012, which js a rescue organization. In HUNOR I was responsible for earthquake research-rescue, alongside with being the leader of the flood-lifeguard unit. With the HUNOR rescue organization, I took part in the 2013 Serbian flood rescue, along with the elimination of the 2023 Turkey earthquake.

Teknős László was born on 30 of March 1985 in Debrecen. He is an assistant professor at the Institute of Disaster Management of the Faculty of Law Enforcement of the University of Public Service, fire captain of the professional disaster management organization. Graduated in 2010 as a Certified Defense Administrative Manager, and in 2015 earned a PhD in Military Engineering. In 2021, received a degree in agricultural engineering from Szent István University. With his research on climate change and disaster management, he has participated in several Hungarian projects as a researcher, as has won various positions and awards in several national and professional competitions. He was named 'excellent lecturer' of the Institute of Disaster Management of the National University of Public Service in the academic year of 2017/2018. In 2020, he received the János Korponay Prize from the Hungarian Military Science Society and his short monograph entitled 'Disaster Management Tasks Due to the Effects of Climate Change and Extreme Weather' was awarded the Publication Level Award in the category of natural and technical sciences at the National University of Public Service. On November 26, 2021, 2st place in the tender announced by the Scientific Council for Disaster Management in 2021 with the project entitled 'Investigation, analysis and assessment of the growing tendencies of natural disasters and events from the perspective of disaster management'. 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.

Tlou Raphela PhD, Lecturer (The University of the Free State, Bloemfontein, South Africa). Research interest: I am a socio-environmental scientist, with an interest in how the social issues interface with the environment holistically. I developed an interest in human-wildlife conflict because I believe human and animals can live together in harmony . Since joining the UFS, and teaching the mental Disaster Mental Health ; Public and mental health modules, I developed a strong interest in the Psychosocial impacts of disasters and will be focusing my research and creating a niche around that. Education: I hold a PhD in Conservation Ecology Specialising in Zoology from the University of the Witwatersrand, my Msc is in social Sciences specialising in Disaster Management from the University of the Free State. My undergraduate Bsc degree (obtained with 10 distinctions) with majors in Zoology and Botany is from the University of South Africa. My PhD research focused on the impact of crop

raiding on subsistence farming community adjacent protected area in the rural South African community. My areas of interest include conservation biology, biodiversity, I am more of an Animal, Plant and Environmental Sciences person, leaning more to animals (human and non-humans). I am also interested in Risk Reduction, impact studies to understand socio-environmental problems and Biological invasion.

Tomka Peter joined the Budapest Fire Department in 2010 and is currently serving as a squad commander at the 10th District Fire Department. He holds Master's degrees in Disaster Management and Disaster Protection Engineering an is currently pursuing his doctorate at the University of Public Service, where he is researching the efficiency and safety of interior firefighting. He has won the Balogh Imre Memorial Competition in 2015 and was awarded the Medal of Valor in 2019.



Tóth Balázs was born on February 12, 1978 in Pápa. He started his professional service as a soldier and has been a firefighter since 2004. In 2019, he graduated from the National Public Service University with a degree in Fire Protection and Rescue Management as a BA student. Since 2021, he has been a student of the Master's program in Disaster Management at the National University of Public Service. He served as an intervention firefighter in the Győr Professional Fire Command. He is currently serving at the County Disaster Management Directorate of Győr-Moson-Sopron, his position is KML commander. His research area is rescue and fire protection, including the effect of protective equipment on the workload of firefighters.

Vásárhelyi Örs is a first-year Ph.D. student in the Doctoral School of Military Engineering faculty of the University of Public Service.He works as an IT Security Consultant at Alverad Technology Focus Kft.Örs Vásárhelyi was born and lives in Budapest. He completed his high school graduation at Vörösmarty Mihály grammar school. Then he was admitted to the University of Public Service, specializing in Disaster Management Industrial Safety. In 2017 he participated in the XXXIII OTDK competition where his work received an award. He obtained his Bachelor of Arts degree from the university.Following his graduation, he continued his studies at the University of Public Service. However, due to Covid-19, he had to interrupt his education.In the meanwhile, in 2021, he graduated from Mymove Fitness School and has become a sport instructor in bodybuilding and fitness. In 2022, he is obtained a master's degree in Disaster Management. Also in this year, he got his ISO/IEC: 27001:2013 Lead Auditor certificate.

Végső Alexandra is 20 years old, studying at the University of Public Service majoring at disaster management. Currently she is in her third year specializing in Industrial Safety. She will get her university degree in 2023. At the same year she will apply for Master's degree, because she wants to continue her studies there in the future.

Waiganjo Luka (PhD) is a Lecturer in the Department of Physical Education, exercise and Sport Science. He has a Bachelor of Education (Second Class Honors Upper Division) in Physical and Health Education from Kenyatta University. He also did graduate studies at the same university and obtained Master of Science, Physical and Health Education as well as Doctorate in Physical Education. He has also published with African Journal for Physical, Health Education, Recreation and Dance (AJPHERD), Kenya Association for Health, Physical Education, Recreation, Sports and Dance (KAHPER-SD) and Asian Journal of Applied Sciences as well as International Journal of Environmental Research and Public Health. His research interests are in Sports & Exercise Ergonomics, Occupational Ergonomics and Outdoor & Experiential Training.

Zimin Serhii, born on January 27, 1997, Senior Lieutenant of the Civil Defense Service, researcher in the Department of Organization of Scientific Research and Patent Activities of the Scientific Research Center, National University of Civil Protection of Ukraine, Kharkiv. Born in Verkhovtsevo, Ukraine. In 2019, he graduated from the National University of Civil Defense of Ukraine. Since 2020, has been studying for a Ph.D. degree in specialty 261 "Fire Safety" in the postgraduate course of National University of Civil Defense of Ukraine.

Extended abstracts of the conference

The extended abstract topics of the conference are divided into five sections:

Section A – Fire engineering

Section B – Fire protection

Section C – Firefighting and rescue operation management

Section D – Disaster management

Section E – Safety and security

Section A – Fire engineering

Éva Gyöngyösy

Fire safety of cables in oxygen-rich environment

Abstract

The last pandemic years have lighted it up for many people that, how important is to get enough oxigen into our blood trough our lung, from the atmosphere, and how big problem can be cause in lack of this. Based on the effects of the virus caused, a lot of people had this kind of problem, which could be handled in the hospitals as added oxygen to them via machines, thus healthcare facilities role has increased, same like the quantity of used and stored oxygen has increased also. Oxygen as a necessary drug is needed for the humans, animals and plants, however in addition it is a necessary component for the fire and burn also. Unfortunately, we have several example cases in all around the world, how easily can be fire begin in this situation, and how massive consequences can cause. Built-in electric cable systems have complex functions in the facilities, as it operates several systems like fire alarm system, extinguishing system, however it can support spread of fire or can be the cause of the fire also. This is the reason, why we should take more attention to them. In my research I would like to provide an alterntive opportunity to test qualification of electric cables. By the oxygen index determination, as individual method, we would be able to test materials in oxygen-rich environment, which differ from the other standarded methods.
Keywords: oxygen-rich environment, oxigen index, fire protectin, cable, qualification

Introduction

Based on the last pandemic years, because of COVID-19 virus, importance of role of hospitals has increased dramatically. Hospitals normally have several oxygen-rich rooms, like intensive care units, and operating rooms, but their quantity has increased, based on the number of patients, which never was expected before.
Unfortunately, we have earned experience, what means a fire case in this very complex, and difficult situation. These have made us to take our attention to fire protection of the oxygen-rich environment, and to search opportunities to be able to provide higher level of safety. Built-in electric cable systems have complex function in operation of facilities: electric power, and the other would be the communication. Usage of electricity and the quantity of the cables continuously increase with time (except the effect of wireless technologies).
Cables have combined role from view of fire protection also. The are part of the active and passive fire protection, however they can be cause of fire, or support spread of fire, which caused by other reason.

Objective

All the standardized test methods determine flammability habits of electric cables only in normal air with average oxygen concentration (21% O_2), however, to test them in oxygen-rich area would be need in aim to be able to model reality. As complementation of importance of my research, you can see the oxygen concentration effects on the burning.

Figure 1 - Oxygen concentration effects on the burning [5]

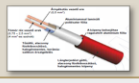
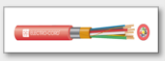
Furthermore, the standardized qualification based on several expensive, and complex tests as you can see in the following table.

Table 1 - Qualification of electric cables EN 50575 [4].

Class	Test methods				
	EN ISO 1716	EN 50399 a	EN 60332-1-2	EN 61034-2 c	EN 60754-2 c, d
A_{ca}	X	-	-	-	-
$B1_{ca}$	-	X [b]	X	X	X
$B2_{ca}$	-	X	X	X	X
C_{ca}	-	X	X	X	X
D_{ca}	-	X	X	X	X
E_{ca}	-	-	X	-	-
F_{ca}	No requirement				

Test method/Results

Measurement of Oxygen Index would be my test method. The measured LOI means the minimum oxygen concentration at which the tested plastics still burn self-sustainingly (the burn is ~8cm, and the sample does not burn any further). [1] [2] [3] 5 types of fire-resistant cables were tested, as they are not able to burn in the air (in average oxygen content).

Cable type		Characteristics		LOI (oxygen index)	Combustion phenomena
1. NOBURN 2X1,9MM2 300/500v		PH30	Xps, ceramic-silicone insulation, halogen-free.	33,7 %	Burning with flame
2. KABTEK JE-H (St.)H.Bd 2x2x0,8		FE180 E90	Halogen-free, solid copper conductive mica tape with core insulation.	33,4 %	Burning with flame, smoking below and above, melting and dripping while burning
3. S.FIRE PROOF JB-H(ST.)H 1x2x1		PH120	Polyolefin outer sheath and vascular insulation; MICA tape and flowable thread.	**37,7 %**	Burning with dripping, melting
4. BRANDMEL DEKABEL 10 eres tűzjelző kábel			Fire alarm cable. Presumably not a fire-resistant cable despite the color of the red jacket. PVC jacket.	<36%	It burned completely, very quickly. With heavy smoke, flying fibrous materials and combustion products.
5. EUROSAFE 2x1 SQMM SHIELDTO BS 638		E90 PH180	Shaded; aluminized synthetic film and flame-resistant PVC jacket.	27,5 %	Burning with dripping, melting, smoking

Findings

We could test flammability habits of the electric cables in higher oxygen content, than in the air (>21%), by this we were able to model real oxygen-rich area.
This method provides opportunity to compare materials, which cannot burn in normal conditions. The method can be applied not only for cables.
Further benefits would be that, this method is fast and cheap test as comparison with the standardized measure methods.

Conclusion, suggestion

Usage of this qualification test method would be suggested in case of oxygen-rich environment, especially in case of hospitals, in aim to avoid complex and massive fire disasters in the future.
Suggested categories based on LOI would be the followings [3]:

- (BA) LOI<20,95 - BA: burning in air
- (NBA) 20,95-28,00 - NBA: non burning in air
- (SE) 28,00-100,00 - SE: self-extinguishing
- (NB) LOI>100,00 – NB: non burning

References

[1] Kerekes Zsuzsanna – Lublóy Éva – Restás Ágoston: Az oxygén index (LOI) alkalmazásának lehetőségei a tűzvédelmi minősítésekben, Védelem Tudomány, I. évfolyam, 3. szám, 16-27. p., 2016. URL: http://www.vedelemtudomany.hu/articles/02-kerekes-lubloy-restas.pdf

[2] MSZ 10200-1989 Műanyagok éghetőségének meghatározása oxigénindexszel), mind nemzetközi szabványok (ISO 4589, ASTM 2863, Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index))

[3] Kerekes Zsuzsanna - Gyöngyössy Éva – Elek Barbara: Tűzoltó kábelek műanyag burkolatának új és hagyományos vizsgálati módszereinek összehasonlító elemzése, Védelem Tudomány, 24-36. p., 2017. URL: http://vedelemtudomany.hu/articles/II/3/02-kerekes-gyongyossy-elek.pdf

[4] MSZ EN 50575:2014/A1:2016 Power, control and communication cables. Cables for general applications in construction works subject to reaction to fire requirements.

[5] Linde AG, Safety Advice. 4 – Oxygen enrichment. https://www.linde-gas.be/nl/images/Oxygen%20enrichment_tcm171-72933.pdf

Kostiantyn Afanasenko - Serhii Zimin

Parameters of heat exchange during the operation of the biogas complexes flare stack

Abstract

An experimental stand simulating a closed-type flare installation was developed and manufactured in order to study the temperature regime when it enters a stable mode of operation. Data on the distribution of temperatures at the points of the casing of the experimental stand during its start-up and transition to a stable mode were obtained. It was concluded that it is necessary to set the parameters of thermal radiation during the operation of the flare device. Based on the equations of the theory of thermal conductivity, the calculation of the specific values of the heat-transfer coefficient of the flare device casing wall to the surrounding environment was carried out.
Keywords: flare systems, flare stacks, temperature, thermal radiation, heat-transfer coefficient

Introduction

Enterprises belonging to chemical, petrochemical, energy complexes, in the technological process of which combustible gases, flammable and combustible liquids circulate, most often (depending on the technological scheme) have flare systems designed for smokeless combustion of combustible and toxic gases. or vapors as a result of their periodic, emergency or permanent discharge [1, 2]. Considering the fact that flare systems are used at industrial enterprises associated with the circulation of a large volume of combustible gases and flammable liquids, the consequences of accidents at these installations can be quite serious, both in terms of the death and injury of people, and in terms of material losses. Thus, ensuring fire safety during normal and emergency operation of flare systems is an urgent problem. In authors previous papers, an evaluation of the operation temperature mode of the torch installation model was carried out (Fig. 1).

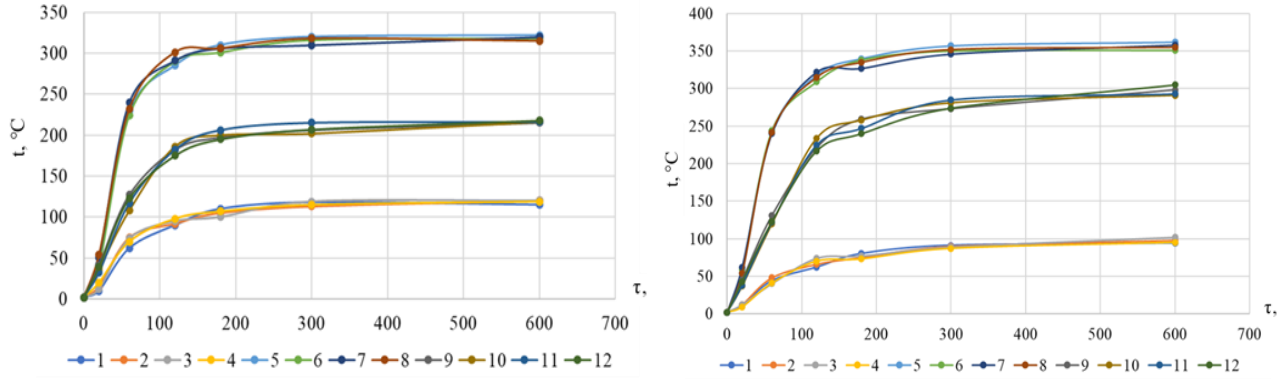


Figure 1 - Dependence of temperatures on the casing outer surface (at points 1–12, with flow rate q=11 and 19 l/min.).

The appearance of the experimental unit is shown in Figure 2.

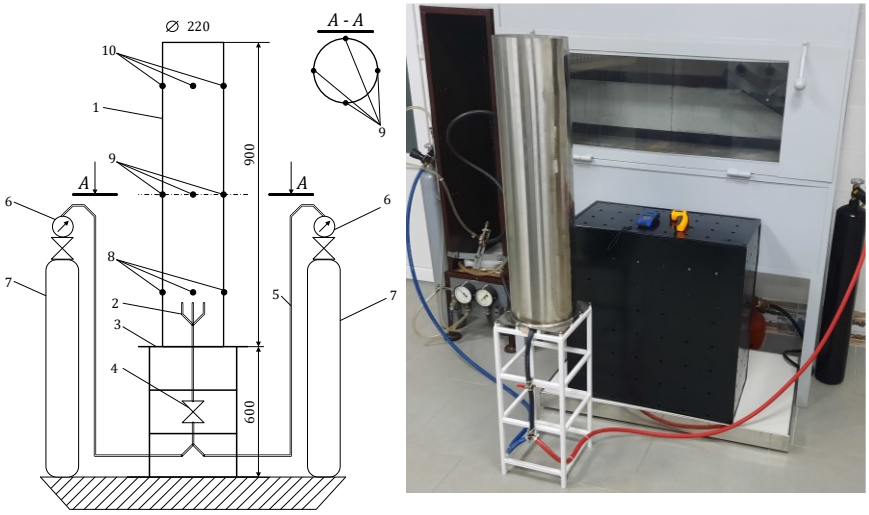


Figure 2 -Scheme and appearance of the experimental unit.

1 – Torch barrel casing; 2 – Burner; 3 – Foundation slab; 4 – Crane; 5 – Connecting hoses; 6 – Manometers-flowmeters; 7 – Tanks (carbon dioxide and methane); 8 – Temperature control points (lower belt); 9 – Temperature control points (middle zone); 10 – Temperature control points (upper belt).

The analysis of the obtained experimental data allows us to speak about a negative temperature influx on a surrounding environment during normal operation of flare stacks.

Objective

The objective of paper is determination of the parameters of heat transfer during normal operation of flare stacks.
To achieve the objective, it is necessary to overcome the next task:

– to conduct an analysis of the thermal conductivity of the flare stack;

– to carry out examinations of the specific values of the heat-transfer coefficient of the flare stack casing wall to the surrounding environment.

Method

The calculation scheme of the casing wall of the flare stack was considered (Fig. 3).

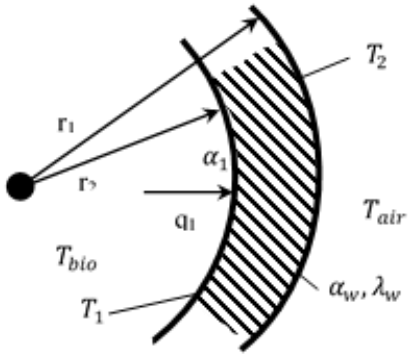


Figure 3 - Calculation scheme of the wall of the flare device casing

Then the heat conduction equation for the wall of the flare stack casing can be written in the following form

$$\frac{\partial}{\partial \tau}T(r,\tau) = \alpha \cdot \left(\frac{\partial^2}{\partial r^2}T(r,\tau) + \frac{\frac{\partial}{\partial r}T(r,\tau)}{r}\right), \quad (1)$$

where α – coefficient of thermal conductivity; $T(r,\tau)$ – the temperature value at the distance r from the center of the casing at the time τ.

Next, boundary conditions of the first order on the inner and third order on the outer surface of the casing wall are adopted

$$T_1 = T_{bio} \quad (2)$$

$$\lambda_w \frac{\partial}{\partial r}T(r,\tau)\Big|_{r=r_2} = \alpha_2(T_2 - T_{air}) \quad (3)$$

It should also be taken into account that T_{air} and q_2 interconnected, that is

$$T_{air} = f\left(\lambda_w \cdot \frac{\partial T_2}{\partial r}, \quad S_{surf}, \quad m_{air}, \quad \alpha_2\right), \quad (4)$$

where S_{surf} – the area through which the heat flow q_2 passes, m_{air} – the mass of air in the radius r.

During mathematical model building, the following assumptions were made:

- the temperature on the inner wall of the casing is the same and equal to the temperature of the products of biogas combustion (boundary conditions of the first order);
- the thermal conductivity through the production armature of the flare device is not taken into account in the calculation scheme;
- in the process of heating, the geometric parameters of the casing wall do not change.

Results

The coefficient of heat transfer when using a flare device for burning biogas can be determined based on the following expression

$$Nu = \frac{\alpha \cdot L}{\lambda}, \quad (5)$$

where Nu – the criterion of the similarity of thermal processes, which characterizes the ratio between the intensity of heat exchange due to convection and the intensity of heat exchange due to heat conduction; α – heat transfer coefficient; λ – thermal conductivity coefficient; L – characteristic size.

Average value $\overline{Nu}$, for the case of free convection on the vertical wall was determined by the formula:

$$Nu = 0{,}68 + \frac{0{,}67 \cdot (Gr \cdot Pr)^{1/4}}{[1 + (0{,}492/Pr)^{9/16}]^{4/9}}, (Gr \cdot Pr) \leq 10^9, \quad (6)$$

where Pr – the criterion of the similarity of thermal processes in liquids and gases, which takes into account the influence of the physical properties of the heat carrier on heat transfer (for triatomic and polyatomic gases $0{,}75 \leq Pr \leq 1$); Gr – criterion of similarity of heat exchange during free movement in the gravitational field.

The value of Gr was determined according to the following expression

$$Gr = \frac{g\beta(T_2 - T_{air})L^3}{\nu^2}, \quad (7)$$

where: g – acceleration of free fall, g=9.81 m/s²; L – the linear size of the heat exchange surface, m; T_2 – heat exchange surface temperature, K; T_{air} – air temperature, K; ν – coefficient of kinematic viscosity, m²/s; β - temperature volumetric expansion coefficient. For air is , $\beta = 3{,}428 \cdot e^{-0{,}002 \cdot T_2}$, 1/K.

The coefficient of kinematic viscosity is determined in accordance with the formula

$$\nu = \frac{\eta}{\rho}, \qquad (8)$$

where η – the coefficient of dynamic viscosity, Pa·s.

It was shown that the coefficient of kinematic viscosity of air depends on temperature and is invariant to the pressure value. As a result of experimental data processing, a dependence of kinematic viscosity as a function of temperature was obtained.

In Fig. 4 shows the calculated values of the similarity criterion depending on various conditions.

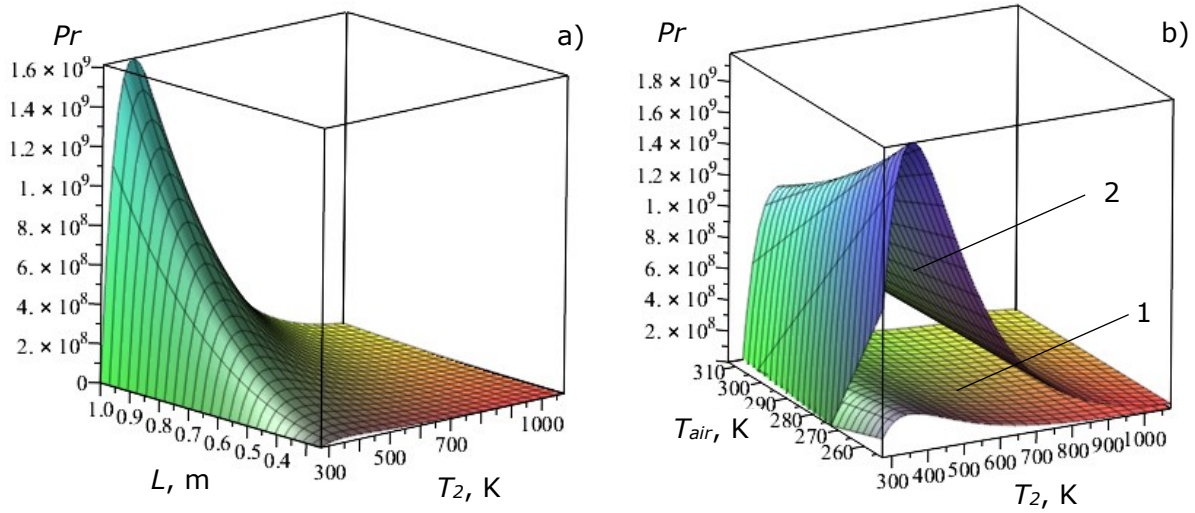


Figure 4 - The value of the similarity criterion of heat exchange depending on the characteristic geometric size and surface temperature (a), and on the air temperature and surface temperature (b). 1 – *L*=0.5 m, 2 – *L*=1 m.

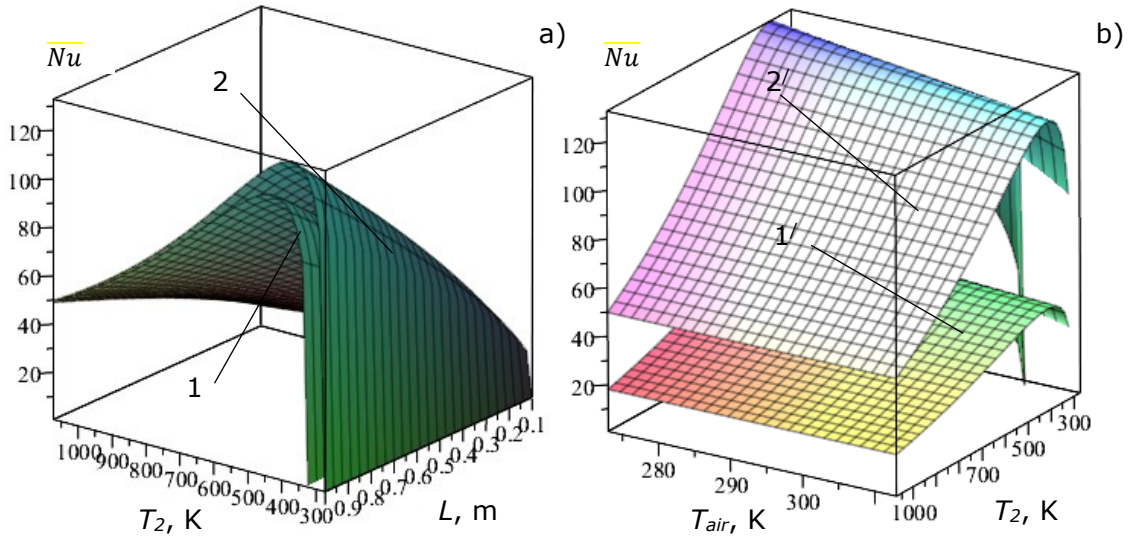


Figure 5 -The value of average criterion of the similarity of thermal processes $\overline{Nu}$ on the characteristic geometric size and surface temperature (a), and on the air temperature and surface temperature (b). 1 - T_{air}=273 K, 2 - T_{air}=313 K; $1^{/}$ – *L*=0.5 m, $2^{/}$ – *L*=1 m.

Figures 5 and 6 show the dependences of average criterion of the similarity of thermal processes and heat transfer coefficient, respectively, depending on various criteria.

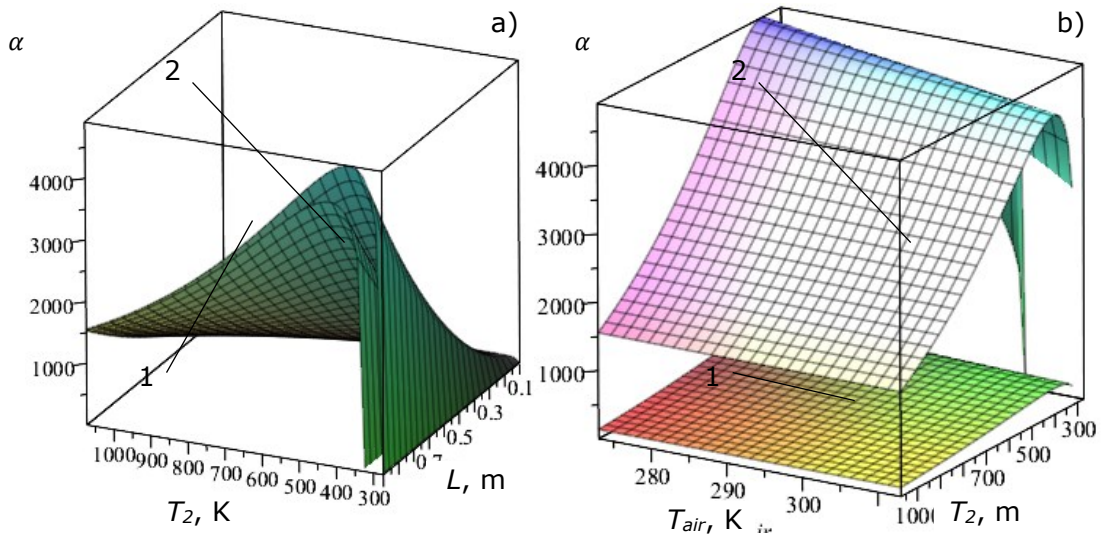


Figure 6 - The value of heat transfer coefficient α on the characteristic geometric size and surface temperature (a), and on the air temperature and surface temperature (b). 1 - T_{air}=273 K, 2 - T_{air}=313 K; $1^{/}$ – L=0.5 m, $2^{/}$ – L=1 m.

Analysis of figures 5 and 6 shows that the value of the coefficients responsible for heat transfer during the operation of the flare stacks is non-linear and needs further study.

Conclusion

An experimental stand simulating a closed-type flare installation was developed and manufactured in order to study the temperature regime when it enters a stable mode of operation. Data on the distribution of temperatures at the points of the casing of the experimental stand during its start-up and transition to a stable mode were obtained.
The calculation of the heat transfer coefficient for the flare stack was carried out. It was found that the coefficient has a nonlinear dependence on the casing temperature and the linear characteristic dimensions of the device and less depends on initial temperature of outer air.

References

[1] Smith, J.D., Jackson, R., Suo-Antilla, A. (2017). Estimated flare emissions created during flare ignition transient. International Conference on Environmental Impacts of the Oil and Gas Industries: Kurdistan Region of Iraq as a Case Study (EIOGI), 1–2. doi:10.1109/EIOGI.2017.8267637

[2] Zimin, S., Afanasenko, K., Lypovyi, V. (2022). The temperature regime of a closed-type flare system. Problems of Emergency Situations: Scientific Journal, vol. 2(36), pp. 267-279. DOI: https://doi.org/10.52363/2524-0226-2022-36-20.

[3] Robert Serth, Thomas Lestina, Robert Serth (2007). Process Heat Transfer. Principles, Applications and Rules of Thumb; 1st Edition. Academic Press. 770 p.

Volodymyr Lipovyi - Andrii Harkavyi

Investigation of the thermal effect of the jet washing up liquid to oil sediments tank

Abstract

The process of heat exchange between the cleaning solution and petroleum residue during the jet cleaning of tanks from petroleum deposits has been considered. The cleaning is carried out with a heated solution of technical cleaning agents. This will allow to identify the influence of factors on the technogenic risks of environmental pollution by harmful substances that are formed as a result of operation and repair of tanks with petroleum products, as well as to determine the parameters of the explosion and fire hazard of the process.
Keywords: heat exchange process, petroleum residue, tank with petroleum products, explosion and fire hazard, environmental hazard, technogenic risks.

Introduction

As is known, emergency emissions and leaks of harmful substances resulting from routine and repair work on the cleaning of internal technological surfaces of tanks with petroleum products can lead to local to catastrophic levels of environmental and human harm. During the unloading of tanks, a portion of the petroleum products adheres to the internal surfaces and structures in the form of a continuous (adhesive) layer. In addition, a certain portion remains in the pipes, fittings, and pumps of the cargo and suction systems. As a result, an unremovable residue is formed, the quantity of which varies widely and depends on a number of factors, such as the physicochemical properties of the petroleum products, the temperature regime of transportation, the technical condition of the cargo system, and so on.
The solution to the urgent scientific and technical problem of identifying the influence of factors on the technogenic risks of environmental pollution with harmful substances that are formed as a result of the operation and repair of tanks with petroleum products is the scientific basis for improving the system of ensuring environmental safety and conditions of reliable safety of human life around such facilities [1].

Objective

According to [2], a layer of deposits forms on the bottoms of tanks throughout the year:

- in light petroleum products – 5-10 mm; in oils – 20 – 50 mm;
- in heavy fuel oil and motor fuels – 25 – 100 mm;

During the cleaning process, there is an increase in the temperature of the petroleum sludge due to the heat transfer from the cleaning fluid. This leads to intensification of evaporation from the surface of the deposits and increases the concentration of flammable vapors in the tank and adjacent areas (Figure 1).

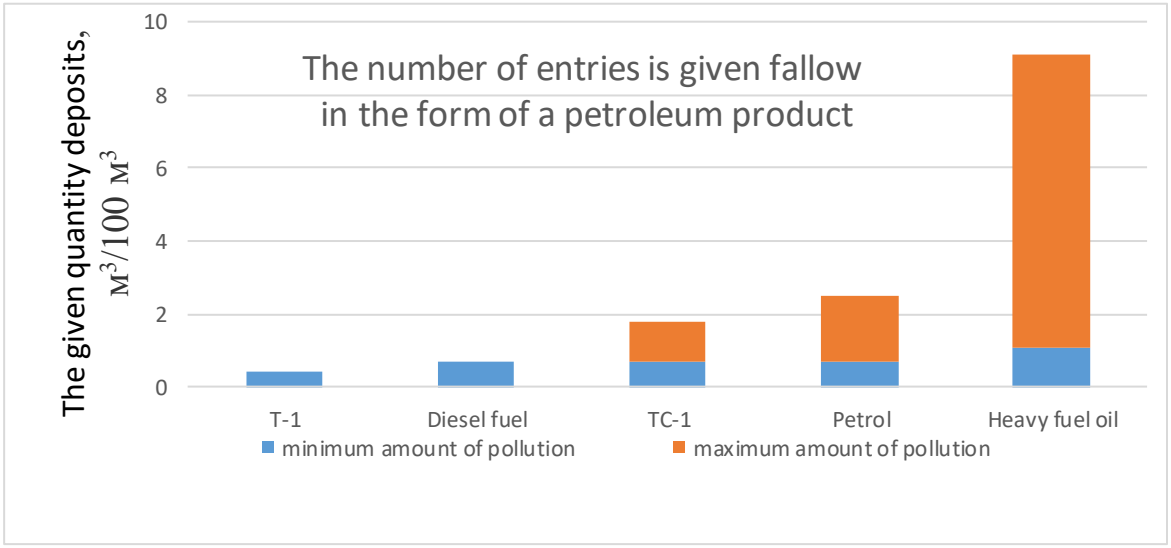


Figure 1 - The amount of residual contamination is given per 100 m^3 of tank capacity.

The aim of this work is to investigate the heat transfer between a jet of washing liquid and petroleum residues when cleaning deposits on the inner surfaces of reservoirs containing petroleum products. It is important to determine how the temperature of the sediment layer will change upon contact with the washing solution, given that the temperature of the liquid may differ from that of the petroleum residue.

Method

To analyze this heat transfer process, certain assumptions are made. Firstly, the process is considered as stationary, in which the temperature of the bodies remains constant over time. Secondly, we neglect the heat loss during the heat transfer from water to the gaseous environment inside the reservoir. This assumption is completely justified, as practice shows that the temperature difference between water t_w and the atmosphere of the reservoir t_t is 10-12 ºC, which is significantly lower than the difference between t_w and the temperature of the environment t_A (air) that comes into contact with the external surface of the reservoir, that is $(t_w - t_t) \ll (t_w - t_A)$, therefore, heat will mainly be transferred from the liquid in the direction of the highest temperature gradient. The heat transfer process is analyzed using a graphical method to determine the temperatures on the surface of the layers of a non-uniform wall, based on the property of a linear dependence of the temperature gradient q in the wall on its thermal resistance 1/k:
$t_w - t_A = q \cdot \frac{1}{K}$ or for any layer $t_{ci} - -t_{c(i-1)} = q\frac{\delta_{ci}}{\lambda ci}$, where k is the coefficient of heat transfer and δ_{ci} and λ_{ci} are the thickness and coefficient of thermal conductivity of the i-th layer. This makes it possible to construct a fictitious wall, in which the thicknesses of the layers will be proportional to the corresponding thermal resistances, and the external thermal resistances of heat transfer will be equal to $1/\alpha_1$ i $1/\alpha_2$, where α_1 is the coefficient of heat transfer from the liquid to the layer of oil residues, and α_2 is the coefficient of heat transfer from the external surface of the reservoir wall to the contacting medium (air). The overall thermal resistance of heat transfer through such a wall is:

$$R = \frac{1}{k} = \frac{1}{a_1} + \frac{\delta_{ad}}{\lambda_{ad}} + \frac{\delta_w}{\lambda_w} + \frac{1}{a_2}, \qquad 1$$

where δ_w, λ_{ad} and λ_w are the thickness of the tank wall and the thermal conductivities of the petroleum residue and wall material, respectively (reference data).
The thickness of the layer of petroleum products adhering to the tank wall is determined by the relationship δ_{ad} = K/ρ (m), where ρ (kg·m^3) is the density of petroleum products, and K (kg/m^2) is the adhesion coefficient. The unknown quantities in formula (1) are the heat transfer coefficients α_1 and α_2.

Findings/results

When water flows in a film, α_1 can be determined from the Nusselt criterion for film flow:
$Nu = 4a_1\delta_w/\lambda_w$, where δ_w, and λ_w are, respectively, the thickness of the liquid film and the thermal conductivity of the liquid.
To determine α_1, it is necessary to know the values of Nu and δ_w. To estimate them, the results of a theoretical study of the interaction of a water jet with the wall of a tank during its cooling in a fire, carried out by A.E. Basmannov and A.A. Mykhailiuk [8], were used. The purpose of the study was to assess the speed of water film flow along the tank wall after the jet impact, the thickness of the water film, and the boundaries of the cooling area (the width of the water film that flows). At the same time, since the diameter of the tank is much larger than the width of the water film, the authors of the study neglected the curvature of the tank surface and studied the process of water film flow along a flat vertical wall.
The work provides data on the thickness δ_w and width b_w of the water film at a water flow rate through a fire hose of V = 0.0045 m^3/s. This value coincides with the average flow rate of washing water through one nozzle of a washing machine. Therefore, it is justified to use the values of the water film flow parameters given in for further calculations: δ_w =0.001 m, b_w =1.6 m.
The value of the criterion can be determined using the nomogram presented in, knowing the values of the Reynolds Re and Prandtl Pr criteria for film flow:
$Re = 4V/b_w\vartheta_w$, where υ_w is the kinematic viscosity of water;
$P_r = \vartheta_l \cdot C_p\rho_l/\lambda_l$, where C_p, ρ_l, and λ_l are the specific isobaric heat capacity, density, and thermal conductivity of the liquid, respectively.
At the adopted temperature of the wash water t_w=50°C (minimum recommended by the water temperature), the Reynolds number is Re=17629.0, Prandtl number is Pr=4.25, and the Nusselt criterion is determined as Nu=86.0 by the nomogram, λ_1=13975.0 W/m²·K.
There is no information in the special literature about the value of the heat transfer coefficient from a flat wall to air. However, normative regulated data on heat transfer coefficients from petroleum cargoes through the steel wall of a tank to air at a temperature of t_m=-25°C (k_1) and onboard water at a temperature of t_m=0°C (k_2) have been identified. Taking this into account, formula (1) takes the form:

$$R = \frac{1}{k} = \frac{1}{a_1} + \frac{\delta_{ad}}{\lambda_{ad}} + \frac{1}{k_{1,2}} \qquad 2$$

According to the graphical dependencies presented in, the values of k_1=4.28 W/m²·K and k_2=18.75 W/m²·K have been determined. The results of the analysis of the heat transfer process from the flowing film of washing water through a multilayer flat wall in graphical interpretation are presented in Fig. 2, where the values of thermal resistances, $1/\alpha_1$, δ_{ad}/α_{ad}, and $1/k_{1,2}$, are plotted on the abscissa axis in the accepted scale, and on the ordinate axis, the washing water temperature t_w=50°C and the corresponding temperatures of the environment: air – t_A=-25°C.

The thickness of the layer of petroleum products adhered to the vertical walls of the tank is determined from tabular data, δ_{ad} = (0.007...0.066)·10^{-3} m, for the tank bottom surface δ_{ad}= (0.040...0.450)·10^{-3} m. To increase the clarity of the graphical representation of the heat transfer process, we assume a thickness of petroleum residues layer δ_{ad} = 0.001 m, which is two to three orders of magnitude higher than the mentioned values of δ_{ad}.
The thermal resistances that are included in the expression (2) have the following values:
$1/\alpha_1$=0.072·10^{-3} m^2·K/W; δ_{ad}/λ_{ad}=1,54·10^{-3} m^2·K/W
(λ_{ad}=65,0·10^{-2} W/m·K);$1/k_1$=230,0·10^{-3} m^2·K/W; $1/k_2$=53,0·10^{-3} m^2·K/W

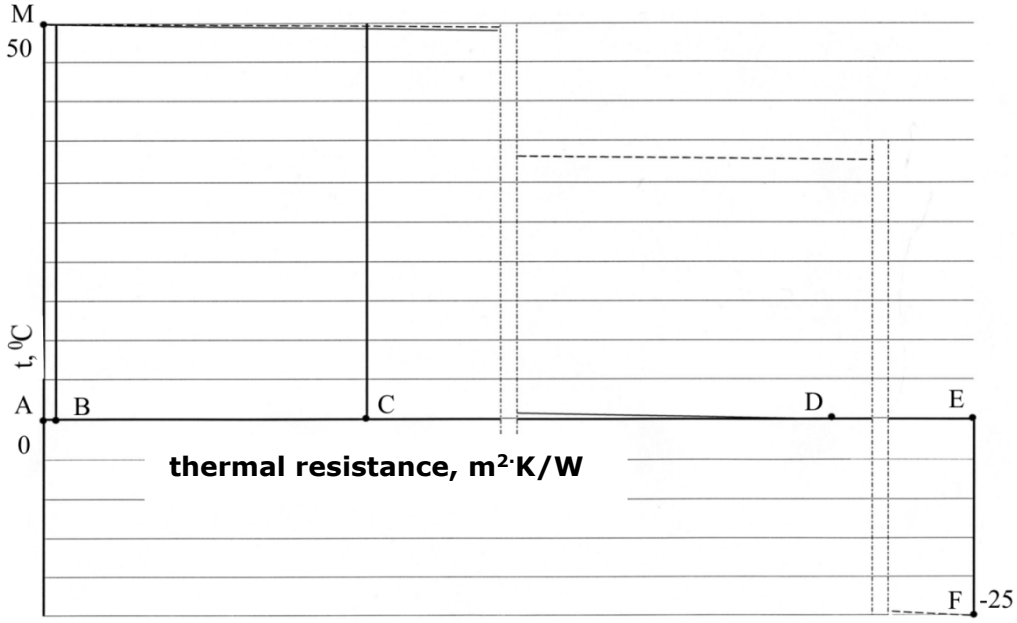


Figure 2 - Graphic representation of the heat exchange process between the cleaning fluid and the layer of petroleum residues on the surface of the reservoir.

The values of thermal resistances on Fig. 2 are represented by line segments AB, BC, CE, and CD. The temperature change in the multilayer wall during heat transfer to the air of the surrounding environment is shown by straight lines MD (solid line) and MF (dashed line). As can be seen from Fig. 2, the temperature difference between the layer of petroleum residues and the cleaning fluid does not exceed 1.5 ºC, even with a significantly increased thickness of the layer. For the layer thickness values mentioned above, determined from experimental data, the temperature difference will be even smaller.

Conclusion/suggestions

The obtained parameters that affect the explosion and fire hazard of the process of cleaning tanks from petroleum product residues (temperature regime, duration of hazardous concentrations of petroleum vapors, concentrations of petroleum vapors inside the tank during cleaning) allow predicting the degree of danger of the work and developing effective measures to prevent emergencies and reduce technological risks.

As the temperature of the liquid used for hydraulic cleaning of internal surfaces of tanks from petroleum products increases, the temperature of deposits also increases, but not significantly. For example, at a solution temperature of 50°C and an external tank temperature of -25°C, the temperature of the surface of the petroleum residue will increase by 1.5°C

References

[1] Akimov, V. A., Lapin, V. L., Popov, V. M., Puchkov, V. A., Tomakov, V. I., Falee, M. I. (2002). Nadezhnost' tehnicheskih sistem i tehnogennyj risk. Moscow: ZAO FID «Delovoj jekspress», 368.

[2] Kacman, F. M. (2003). Zashhita ot korrozii neftjanyh rezervuarov-aktual'naja zadacha sovremennosti. Zhurnal Neftegaz, 11, 17–19.

[3] Shavlovskij, S. S. (1979). Osnovy dinamiki strui pri razrushenii gornogo massiva. Moscow: Nauka, 174.

[4] Golikov, V. A., Anfinogentov, V. V. (2011). Tehnologija nauchnogo issledovanija po sovershenstvovaniju predremontnoj podgotovki tankov neftenalivnyh sudov. Problemy sbalansirovannosti mirovogo rynka morskoj torgovli, 47–52.

[5] Anfinogentov, V. V. (2010). Opredelenie kolichestva tehnologicheskogo ostatka mazutov posle vygruzki tankera. Sudovozhdenie: collection of scientific papers, 19, 8–13.

[6] Udjanskij, N. N., Lipovoj, V. A., Larin, A. N., Kardenov, S. A. (2014). Zadacha teploobmena pri strujnoj ochistke rezervuarov ot ostatkov nefteproduktov. Vestnik Kokshetauskogo tehnicheskogo instituta Ministerstva po chrezvychajnym situacijam Respubliki Kazahstan, 1(13), 52–55.

[7] Gimaletdinov, G. M., Sattarova, D. M. (2006). Sposoby ochistki i predotvrashhenija nakoplenija donnyh otlozhenij v rezervuarah. Neftegazovoe delo: scientific and technical journal, 1, 40–52.

[8] Basmanov, A. E., Mihajljuk, A. A. (2009). Vzaimodejstvie vodjanoj strui so stenkoj rezervuara pri ego ohlazhdenii v uslovijah pozhara. Problemy pozharnoj bezopasnosti, 25, 14–19.

Volodymyr Oliinik – Olesya Slavhorodska

Experimental Determination of the Parameters of the Liquid Infiltration into the Sand

Abstract

Based on the Green-Ampt model we plotted the curve to show the dependence between the time and the depth of the liquid infiltration into the loose material. This curve was obtained by solving the system of differential equations. One of these equations describes a decrease in the surface liquid layer thickness and the other equation describes the in-depth infiltration dynamics. The logarithmic function expansion into series allows us to turn from the irrational expression to the approximating polynomial. Polynomial coefficients are defined by the least square method. Using as an example the infiltration of the raw oil into the sand we showed that the polynomial with the addends of the second and third orders satisfactory approximates the specified dependence of the infiltration time on the infiltration depth. In this case, the approximation error is within 10% after the first minute of the accidental spill. A linear character of the relationship between the thickness of the liquid layer spilled on the sand surface and the infiltration depth enables the evaluation of the statistical parameter of infiltration, i.e. the porosity factor.
Keywords: liquid spread, infiltration parameters, Green–Ampt model and the porosity factor.

Introduction

Many emergency situations that arise in chemical and recycling industries, including the transport originate due to the accidental spread of flammable or other unsafe liquids [1]. The infiltration of liquid into the ground results in the contamination of water resources, in particular underground waters [2] and river waters [3]. However, the ignition of the flammable liquid presents the greatest danger. It threatens with the spread of fire to neighboring industrial facilities and natural landscapes and it also results in the discharge of contaminating substances into the atmosphere [4]. Spreading at large distances, these substances essentially affect the air state and create certain risks for the population [5]. Paper [6] analyzes the risks relating to the transportation of dangerous cargoes by railway. In spite of the available normative documents that govern fire safety regulations for the transportation of dangerous cargoes the latter sometimes cause emergency situations. It is confirmed by extraordinary situations caused by the spread or combustion of flammable liquids not only on the railways in Ukraine but also worldwide according to the latest events.

2021 (the USA, Texas) the train carrying oil products went off the rails and hit the truck. Three tank cars caught fire, the flame height attained several tens of meters. The people living in the neighborhood were evacuated.

2020 (the USA, Arizona) oil tanks with highly flammable liquids went off the rails and inflamed.

2020 (Kazakhstan, Zhambil region) the petroleum tank car went off the rails, the liquid was spilled and inflamed. The fire caught the area of nearly 600 m^{2}.

2019 (Canada, Manitoba) the train carrying 37 oil tanks went off the rails and the oil was partially spilled.

Objective

The objective of this paper was to develop the experimental method to estimate the parameters of the liquid infiltration into the loose material.

Methods

The infiltration of liquid into the loose material, in particular ground is described by Green-Ampt model [7]. The model gives consideration to the boundary between the dry and wet grounds. The infiltration of the liquid in-depth of the ground results in the shift of this boundary downward. Let's orient the vertical axis Z making it to coincide with the infiltration vector (Fig.1).

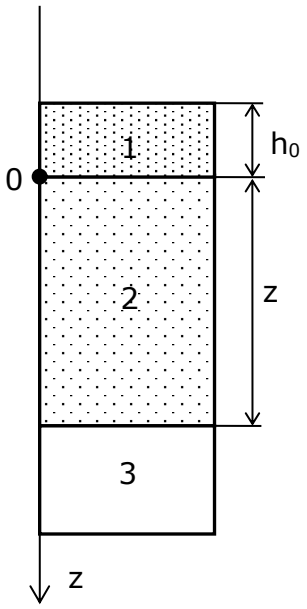


Figure 1 - Infiltration of the liquid deep into the ground: 1- the surface liquid; 2 – wetted ground; 3 – dry ground.

Then, the infiltration rate can be expressed as:

$$q = \frac{\partial z}{\partial t}. \qquad (1)$$

The infiltration rate is described by the Darcy's law

$$q = K\frac{\partial H}{\partial z}, \qquad 2)$$

where K is the hydraulic conductivity of the wetted ground and $\frac{\partial H}{\partial z}$ is the hydraulic gradient:

$$\frac{\partial H}{\partial z} = \frac{h_0 + z + h_f}{z}; \qquad (3)$$

h_0 is the liquid layer thickness on the ground surface; z is the wetted ground layer thickness; h_f is the capillarity value; h_f is the capillarity– показник капілярності (suction head).

By combining the expressions (1) and (3) we obtain the equations

$$\frac{\partial z}{\partial t} = K\frac{h_0 + z + h_f}{z}. \qquad (4)$$

The infiltration of the liquid deep into the ground results in a decreased layer thickness on its surface:

$$\frac{\partial h_0}{\partial t} = -\phi\frac{\partial z}{\partial t}, \qquad (5)$$

where ϕ is the ground porosity factor calculated using the expression

$$\phi = \frac{\rho - \rho_b}{\rho}, \qquad (6)$$

where ρ_b is the filled ground density; ρ is the ground particle density.

Hence, the dynamics of the liquid infiltration in-depth of the ground is described by the system of the equations (4)-(5) with initial conditions

$$h_0(0) = c_0, \qquad (7)$$

$$z(0) = 0, \qquad (8)$$

where c_0 is the initial liquid layer thickness on the ground. Solving the equation system (4)-(5) with initial conditions (7)-(8), we will obtain the dependence of the infiltration time on the infiltration depth z.

$$t(z) = \frac{z}{K(1-\phi)} - \frac{c_0 + h_f}{K(1-\phi)^2}\ln\left(1 + \frac{1-\phi}{c_0 + h_f}z\right),\ c_0 - \phi z > 0. \qquad (9)$$

The condition of $c_0 - \phi z > 0$ denotes that the dependence (9) is true under the condition of the availability of the liquid layer on the ground surface. The complete liquid infiltration into the ground will occur under the condition that $c_0 - \phi z = 0$.

A practical use of the dependence (9) requires the determination of the coefficient of hydraulic conductivity K, the ground porosity coefficient ϕ and the capillarity value h_f.In the general case these should be determined experimentally.

Let's note, that the expansion of the $\ln(1+x)$ function in Taylor's series converts (9) into

$$t(z) = \frac{1}{2K(c_0 + h_f)}z^2 - \frac{1-\phi}{3K(c_0 + h_f)^2}z^3 + \frac{(1-\phi)^2}{4K(c_0 + h_f)^3}z^4 - \ldots$$

Binding down to the first two terms of the series we will get the dependence of the infiltration time on the infiltration depth in the form of

$$t(z) \cong az^2 + bz^3. \qquad (10)$$

The unknown coefficients a and b will be sought as the values that provide a minimum of the sum of squares for the calculated infiltration time values $t(z_n)$ derived from the formula to establish their deviation from experimental values t_n:

$$L = \sum_{i=1}^{n} \left(t(z_i) - t_i\right)^2 \underset{a,\,b}{\rightarrow} \min . \qquad (11)$$

The substitution of (10) for (11) gives the minimization problem:

$$L = \sum_{i=1}^{n} \left(az_i^2 + bz_i^3 - t_i\right)^2 \underset{a,b}{\rightarrow} \min . \qquad (12)$$

Problem (12) has a unified solution that is defined by appropriate extremum conditions: Задача (12) має єдиний розв'язок, який визначається необхідними умовами екстремуму:

$$\frac{\partial L}{\partial a} = 2\sum_{i=1}^{n} \left(az_i^2 + bz_i^3 - t_i\right) z_i^2 = 0 ; \qquad (13)$$

$$\frac{\partial L}{\partial b} = -2\sum_{i=1}^{n} \left(az_i^2 + bz_i^3 - t_i\right) z_i^3 = 0 . \qquad (14)$$

Solving the system of linear equations (13) – (14) with regard to a and b we will get

$$a = \frac{c_{13}c_{22} - c_{23}c_{12}}{c_{11}c_{22} - c_{21}c_{12}} ; \; b = \frac{c_{11}c_{23} - c_{13}c_{21}}{c_{12}c_{21} - c_{11}c_{22}} , \qquad (15)$$

where

$$c_{11} = \sum_{i=1}^{n} z_i^4 ; \; c_{12} = \sum_{i=1}^{n} z_i^5 ; \; c_{13} = \sum_{i=1}^{n} t_i z_i^2 ; \qquad (16)$$

$$c_{21} = \sum_{i=1}^{n} z_i^5 ; \; c_{22} = \sum_{i=1}^{n} z_i^6 ; \; c_{23} = \sum_{i=1}^{n} t_i z_i^3 . \qquad (17)$$

To carry out the experimental research, the sand was used as a loose ground and the cylinder with the diameter of 60mm was filled with this sand. The raw oil was used as a liquid.

The relationship between the oil layer thickness and the infiltration depth is actually linear (Fig.2).

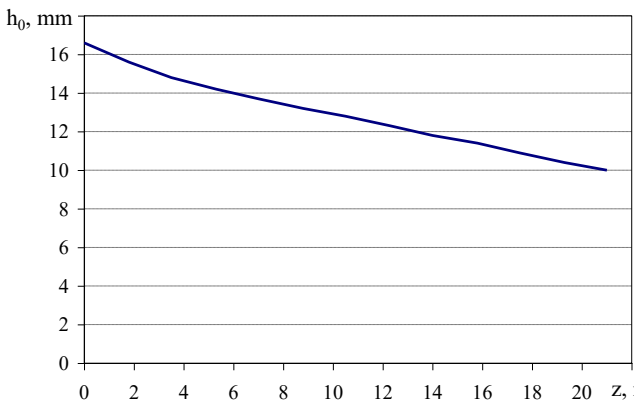


Figure 2 - Relationship between the oil layer thickness on the sand surface and the infiltration depth

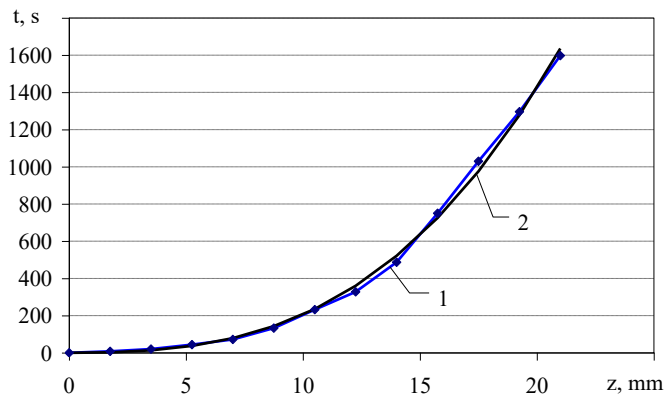


Figure 3 - Dependence of the infiltration time on the infiltration depth: 1-experiment; 2-approximation in the form of (10)

Based on the equation (5) and the data given in Table 1we can determine the porosity factor:

$$\phi = -\frac{\Delta h_0}{\Delta z} \approx 0.314 .$$

The computation of the coefficients using the formulas (15) gives

$$a = 5.6 \cdot 10^5 \ s/m^2 ; \ b = 1.5 \cdot 10^8 \ s/m^3 .$$

Fig. 3 shows the experimental dependence of the infiltration time on the infiltration depth and its approximation (10).

Conclusions

Based on the Green-Ampt model, we can suggest the method for the determination of the parameters of the liquid infiltration into the loose ground. Solving the system of differential equations with one equation describing the liquid layer thickness on the ground surface and the other equation describing the in-depth infiltration dynamics we obtain the relationship between the infiltration time and infiltration depth. The expansion of the logarithmic function into series enables the replacement of the obtained irrational relationship with the approximating polynomial. To estimate polynomial coefficients we used the least-square method that leads to the minimization problem that has the unique solution. The analysis of the infiltration of the raw oil into the sand shows that the infiltration depth and the liquid layer thickness on the sand surface have a linear relationship. It allows us to estimate the value of the static parameter of the infiltration, i.e. the porosity coefficient. The experimental value of it is 0.314.

References

[1] Raja, S., Tauseef, S. M., Abbasi, T. Risk of Fuel Spills and the Transient Models of Spill Area Forecasting. Journal of Failure Analysis and Prevention, 18 (2018) 445–455.

[1] Vasyukov, A., Loboichenko, V., Bushtec,S. Identification of bottled natural waters by using direct conductometry. Ecology, Environment and Conservation, 22, 3 (2016) 1171–1176.

[2] Loboichenko, V. M., Vasyukov, A. E., Tishakova, T. S. Investigations of mineralization of water bodies on the example of river waters of ukraine. Asian Journal of water, environment and pollution, 14(4) (2017) 37–41.

[3] Kustov M. V., Kalugin V. D., Tutunik V. V., Tarakhno E. V. Physicochemical principles of the technology of modified pyrotechnic compositions to reduce the chemical pollution of the atmosphere. Voprosy khimii i khimicheskoi tekhnologii, 1 (2019) 92–99.

[4] Popov, O., Iatsyshyn, A., Kovach, V., Artemchuk, V., Kameneva, I., Taraduda, D., Sobyna, V., Sokolov, D., Dement, M., Yatsyshyn, T. Risk assessment for the population of Kyiv, Ukraine as a result of atmospheric air pollution.

[5] Huang, W., Shuai, B., Zuo, B., Xu, Y., Antwi, E. A systematic railway dangerous goods transportation system risk analysis approach: The 24 model. Journal of Loss Prevention in the Process Industries, 61 (2019) 94-103.

[7] T.K. Tokunaga. Simplified Green-Ampt Model, Imbibition-Based Estimates of Permeability, and Implications for Leak-off in Hydraulic Fracturing. Water Resources Research (2020).

Alexandra Végső

The transportation of hydrocarbons and fire risks

Abstract

Millions of tons of dangerous goods are transported in our country every year. Materials with hazardous properties can be delivered to their area of use in different ways of transportation. The possible method of transportation of this product is transmission line transportation. In Hungary, the transport of hazardous materials is taken in countless ways among which the transport of dangerous goods by pipeline is one of the most dangerous. The positive aspect of the safe transport method is that we can greatly reduce the occurrence of malfunctions. My chosen research topic defines the application possibilities of the pipeline transportation method and the related safety issues and formulates recommendations in relation to the chosen topic.
Keywords: disaster management, dangerous goods, pipeline, transportation

Introduction

The use of hydrocarbons and hydrocarbon derivatives in all areas of the world has increased at lightning speed. The materials used covered areas of use involving monumental industrial areas. It appears for example, in transport, shoe production, the operation of heavy vehicles, as well as in the extraction of open-pit mines. The companies dealing with the petroleum industry use an efficient and economical method to move these energy carriers for finished production, semi-finished production, and materials used for further production. Currently, the conditions listed in advance are met by the transmission method of the product. MOL Nyrt. is Hungary's leading hydrocarbon supplier, user, storage and storage company. The purpose is to guarantee the safety of the affected persons, the areas affected by the pipelines, and the environment during the transportation of hydrocarbons and hydrocarbon derivatives and the appropriate management of the consequences and effects of a serious accident, emergency event or disaster.

MOL Nyrt. The owner and operator of the installed and operated product is the owner and operator of which wires are covered by the full land of Hungary. Due to the dimensions of the pipelines, the transported medium and the high-pressure values during the transport operation, the activity is considered a hazardous transport and material handling process. For example, the MOL group chose this mode of transport because this type of environmental load poses a lower risk to natural and built elements than, for example, rail or road transport. The goal of the MOL group was to ensure that the previously created and introduced legislative changes apply to the product transmission lines it operates. Adherence to and enforcement of the established internal safety rules reduced the likelihood of dangerous situations arising and occurring. I will explain what activities the intervention units must perform during an emergency event and a fire that may arise as a result of a malfunction. The professional disaster prevention corporation and MOL Nyrt. must react appropriately to the intervention in order to ensure that the breakdown or emergency event places as little burden as possible on the given environment. [1]

Objective/Methods

The primary objective of the detection of hazardous substances is to establish with certainty the sufficient level of protection for both the individual and the collective as a whole. Collective protection, the establishment of the zone boundaries necessary for the safe intervention of the participants, is the primary objective, the boundaries of which can be established by considering the spread and properties of the hazardous substance.

Monitoring, as a measurement of the properties of a dangerous transported medium, can be carried out in several ways. Area monitoring consists of placing sensors along the perimeter of the affected incident site to measure the defined values of the properties of the hazardous substance along the boundaries. The sensors placed along the hazardous environment transmit the defined and measured values from the signals received to the central data processor, where the signals are processed and converted into comprehensible information, so that the person in command of the damage site can be immediately informed of the changes. The installed sensors can have several built-in functions. Field detection by handheld devices is a disadvantageous method compared to the aforementioned field monitoring, as the individual in charge cannot take measurements over the entire damage site. In the case of product transmission lines, the primary method of measurement is area monitoring, since in the event of a hazard event, a maximum of 50 tons of transported media with hazardous properties can be released from a pipeline section, and if several pipeline sections are damaged, this is multiplied by six, thus increasing the size of the intervention site. The spillage will be sampled and fully analyzed for its properties. The pipeline method of transport is the safest way to transport hazardous materials, but there can still be incidents. During these kind of events the response is the responsibility of the professional emergency services and their associates. Damage incidents can be divided into several types according to their characteristics, although many depend on the material being transported. It is important to clarify that pipeline transport is only applicable to liquid and gaseous hazardous substances. The method of intervention is largely influenced by the state of the substance being transported and other properties of the substance being transported. By other properties, I mean the classification of the dangerous substance, which may include flammable liquids, flammable gases, corrosive and lethal substances, and many others. Well, these hazardous substances may have more than one of these properties and therefore the intervention in such cases is very complicated. Furthermore, one must keep in mind the cause that led to the occurrence of the damage as there are several possible triggers. These could include damage to the casing of a transmission line, a terrorist attack or even a natural disaster that occurred, as evidenced by the earthquake in Turkey in February 2022. The damage repair process depends on these factors. The monitoring systems that keep track of the material transported in the pipeline are a great help in the intervention process, as they are able to determine not only the fact of the transported hazardous material entering the environment, but also its exact location, which greatly facilitates a successful damage clean-up. In addition, all transport pipelines are equipped with interceptor stations, which prevent further transported material from escaping into the environment and thus mitigate the damage. These cut-off stations can disconnect the damaged transport pipeline section from the entire pipeline network and thus prevent the transported material from escaping into the environment. [2]

Findings/results

The use of product pipelines for the transport of hazardous substances can be a good choice for both the forwarder and the user company. This type of transport of hazardous materials involves less risk and less financial implications than either road or rail transport. Although there are significant financial costs associated with the installation of product pipelines, the reduced risks may make the investment in this type of product pipeline worthwhile. Furthermore, the elimination of the source of human error is another advantage of this mode of transport, as products can be transported without direct human contact. [2]

Conclusion/suggestions

When examining the product transmission lines, it can therefore be concluded that both their traces and in terms of the materials and finished products supplied, Hungary's operational prominent role in Hungary. Product pipelines cover all the vital areas of the country in order to deliver the right amount of fraction to the receiving stations for further distribution and use. Their trails cover all in all cases, end points that touch the most important points in the country as final destinations. Unlike other modes of transport, product pipelines are also less risky because they are closed system. The advantage of a closed system is that, in industry, the high percentage of accidents caused by human error, so we can say that safer transport. A properly maintained pipeline minimizes the risk of and hazards that can occur, and a well-maintained and well-positioned stations also increase safety by allowing the line to be sectioned (excluding certain sections) [3] [4].

References

[1] Jeruska József, Vass Gyula: A magyarországi termék távvezetékek veszélyeinek értékelése file:///C:/Users/Admin/Downloads/06-IB-Jeruska-Vass-3.pdf

[2] Jeruska József- Bérczi László: Veszélyhelyzet kezelés a szénhidrogén terméktávvezeték sérülésével kapcsolatos eseményeknél i. file:///C:/Users/Admin/Downloads/2018_2_12_Jeuska-Berczi-1_MKK-cikk.pdf

[3] Jeruska József - Bérczi László: Veszélyhelyzet kezelés a szénhidrogén termék távvezeték sérülésével kapcsolatos eseményeknél ii. file:///C:/Users/Admin/Downloads/2018_3_07_Jeruska-Berczi_MKK_cikk.pdf

[4] Éva Eszter Lublóy - Ferenc Varga: Non-destructive material testing possibilities of reinforced concrete structures after a fire. Védelem Tudomány 6. 3. (2021), pp. 53-79.

Péter Pántya

Engineering design results for new Hungarian firefighting vehicles

Abstract

The production of fire-fighting vehicles in Hungary has a long history. Recently, through various manufacturing and development collaborations, water carriers of various designs and more than 100 fire engines have rolled out of the Budapest headquarters. Based on the development experience of the past years, the new type of fire engines for Hungary are now in production. They are based on the MAN base vehicle now, previously on the RÁBA - Renault chassis of recent years. A number of technical developments are already visible in the initial stages of production, and the author will give a general presentation of these in this poster presentation.
Keywords: Fire vehicle, design, development, producing

Introduction

Hungary has a century-long history of manufacturing different firefighting vehicles. [1]. After a long hiatus, the design, production and development of modern fire-fighting vehicles in the modern sense of the word, first water carriers and then fire engines, has been resumed by the BM HEROS Company [2]. In general, fire brigades, disaster management organisations around the world have different needs, tasks and types of fire-fighting vehicles for different situations, but the most common are the types of fire-fighting vehicles mentioned above [3] [4].

Given the specialised fire service use, the wide range of equipment and devices carried is also an important consideration in the engineering design of fire vehicles. Different detail aspects can be found in different countries around the world, ranging from general firefighting equipment to different personal protective equipment and different support for fire investigation activities [5] [6].

Methods

For this presentation, the author used his own professional and research experience and made several site visits to the production site in Hungary, and consulted the engineers involved in the development on several occasions [8].

Results

Firefighting vehicles manufactured in Hungary in recent years (Pictures: Author 2019-2023):

Picture 1 – Recent fire vehicles made in Hungary.

AquaMAN (under construction).

More improvements during the engineering design such pump and roll function, changes on the superstructure and the cabin of the vehicle, redesigned steps, new elements to help pump handling (in the Cerberus and manual control system, enlightened buttons, bigger and brighter control display and surface) and new appearance.

Picture 2 - The new Hungarian fire trucks.

Improved safety and driving efficiency. Redesigned rapid attack nozzle position, safety lights, door sensors. Integrated light sources and electronic devices, sockets, reorganised storage spaces. [7]

References

[1] Bérczi László; Berki Imre; Borsos Mihály: A tűzoltó szerkocsik Magyarországon III. A rendszerváltástól napjainkig, Budapest, Hungary: Kossuth Kiadó (2018), 168 p., ISBN: 9789630991957

[2] Berki Imre: R 16 HEROS Aquadux-X 4000; Budapest, Hungary: BM HEROS ZRT (2019), 168 p., ISBN: 9786150044415

[3] Pántya Péter: Special Vehicles and Equipment in Fire Operations Used in Different Regions, Academic and Applied Research in Military and Public Management Science 22: 1 pp. 5-21., 17 p. (2023)

[4] Restás Ágoston; Pántya Péter; Rácz Sándor; Érces Gergő; Hesz József; Bodnár László: A megelőző és mentő tűzvédelem valamint az iparbiztonság

kapcsolódásai, In: Vass Gyula; Mógor Judit; Kovács Gábor - Dobor József; Horváth Hermina Katasztrófavédelem 2018: Veszélyes tevékenységek biztonsága, Budapest, Magyarország : BM OKF (2018) 347 p. pp. 340-340.

[5] Paweł Ogrodnik, Aleksandra Powezka, Robert Piec, Tomasz Zweglinski, Marcin Smolarkiewicz, Paweł Gromek, Rafał Wróbel, Tomasz Wesierski, Małgorzata Majder-Łopatka, Wiktor Wasik: Testing Selected Personal Protection Items of Firefighters in Combined Conditions of Mechanical Loads and Temperatures Occurring during Gas LNG Leaks. November 2021 Energies 14(22):7698, DOI: 10.3390/en14227698

[6] Andrea Majlingova, Danica Kačíková, Martin Zachar, Dominik Špilák: Advanced Methods in Fire Investigation, December 2022, Technical University in Zvolen, Slovakia, ISBN: 978-80-228-3347-9

[7] Tibor Pintér: Tűzoltó gépjármű tervezési folyamata (Fire-fighting vehicle design process) Presentation on site at the BM HEROS Factory, 20.03.2023

[8] Cimer Zsolt - Vass Gyula - Zsitnyányi Attila - Kátai-Urbán Lajos: Application of Chemical Monitoring and Public Alarm Systems to Reduce Public Vulnerability to Major Accidents Involving Dangerous Substances. Symmetry 2021, 13, 1528. https://doi.org/10.3390/sym13081528

Section B – Fire protection

László Bodnár

New challenge of wildfires in Hungary - Fires at Wildland - urban Interface

Abstract

Wildfires are one of the most common natural disasters, which may threat human life and material goods. The number of forest fires is constantly increasing in most European countries, mainly due to the effect of the global climate change. As a result of urbanization and suburbanisation, residential areas have now developed that are close to the wildlands, so the society is getting closer to the environment. These are the so-called Wildland- urban interface (WUI) areas. The Wildland-urban interface (WUI) is an area, where houses meet or intermingle with undeveloped wildland vegetation [1]. The identification of WUI areas is not yet present in all countries, so research is incomplete also in Hungary. In the paper I analyse the statistic on wildfires in the last decade in Hungary and present the first results in the topic of the WUI in Hungary.

Keywords: Wildland-urban Interface, climate change, statistic, public measures

Introduction

The last few years have given many examples of major wildfires worldwide. One such fire was the Portugal wildfire in 2017, which resulted in the deaths of more than 60 people. But it is enough to mention the fires of the Amazon rainforest from 2019, which also received a big attention in the media. There were a huge number of large wildfires also in Australia during the fire season in 2020. These fires resulted one of the greatest devastations in the history of the country. After the international examples, I present some statistic on Hungarian wildfires. The year 2022 is very dry and rainless in Hungary. As a result of it more than 9 000 vegetation fires occurred. This number is already reaching the annual average of the previous years. These fires destroyed an area of roughly 30 000 hectares.

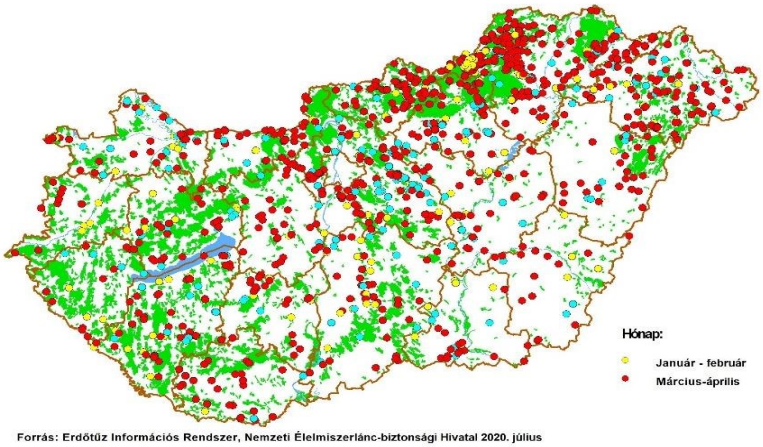


Figure 1- Occurred wildfires in Hungary in the spring fire season. Source: Forest Fire Database, NÉBIH Hungary.

According to the latest report of the World Economic Forum, from the five most likely risk factors, four are related to climate change. Therefore, I also consider climate change to be the main cause of my scientific problem. Global climate change has many consequences. For example the rise of extreme weather events and the change in precipitation. In summer and autumn, the amount of precipitation decreases and in spring and winter increases. According to the relevant climate scenarios The temperature will rise by 1.1 to 6.4 °C in the future. An increase in the average temperature of 0.5 °C can increase the frequency of forest fires by more than 50% [2]. Another scientific problem is that The relationship between the wildland and society has changed. As a result of the urbanization and suburbanization processes, people do not live in the city centre. They live either in the suburb and the outskirt, so the residential areas getting closer to the wildland. Houses can meet or intermingle with undeveloped wildland vegetation, what is called Wildland-uban interface.
After this examination the question arises: Does wildfires threat human life or property? The risk of wildfires can be related to the risk of the combustible fuel and to the risk of residential areas [3] [4]. This is the basis of fires occurred at the WUI. I have already mentioned the scientific problem in connection with the urbanization and suburbanization processes. As a result of these, when houses meet with undeveloped wildland vegetation so-called WUI areas can developed. And if houses intermingle with the undeveloped wildland vegetation so-called WUI Intermix areas can developed. The difference between the two is illustrated in the figure below.

Figure 2 - Examples for WUI and WUI mix areas in Hungary. Source: Google Earth,

The closer a wildfire occurs to residential areas, the greater is the risk of fires. That is why we analyse the fires in the WUI zones in Hungary. Fires occurred less than 500 metres from the residential area belong to WUI zone 1. Fires from 500 to 1000 metres from the residential area are in WUI zone 2. The boundaries of the zones vary by 500 meters. The number of fires in WUI zones 1 and 2 is important to us for the analysis. Based on the statistical data, it can be stated that in a year many fires occur close to the settlements. To prove it, I selected an observation plot, where I examined the occurred wildfires with geo-information system. My observation plot is in Hungary, Borsod-Abauj-Zemplen County, nearby the town Ózd. In the figure we can see lot of points in different colours. Points marked in red occurred in WUI zone 1. Points marked in orange occurred in zone 2. As we can see, most of the fires are generated close to the residential area. This also proves that wildfires can endanger the residential areas.

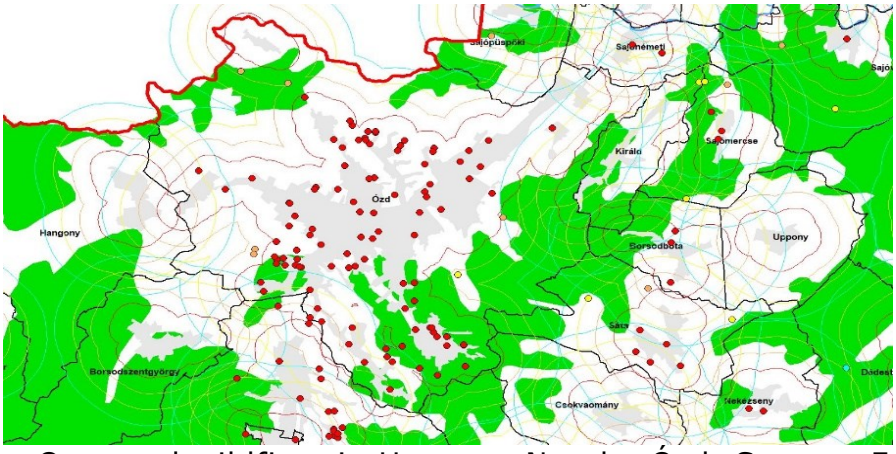


Figure 3 - Occurred wildfires in Hungary Nearby Ózd. Source: Forest Fire Database, NÉBIH Hungary.

Results

After examining the WUI challenge in Hungary, I have collected some public measures that can help to prevent the spread of fire from the wildland to the residential buildings. These are for example:

- Vegetation cleaning along the sidewalk leading to a residential building, so it works as a fire break.
- Regular mowing to reduce the spread of fire.
- Remove the of dry combustible vegetation, thus reducing combustion.
- Regular cleaning of the chimney
- The distance of other flammable structures belonging to the residential building (eg storage, garage) must be at least 10 metres from the residential building.
- Continuous vegetation cleaning and maintenance within 10 metres of the residential building.
- Preference for composting or recycling
- Install a 30 metres long garden hose to extinguish the spot fires [5].

These measures, the experience of fire chiefs [6] and the involvement of volunteers [7] can also help prevent WUI fires.

References

[1] Radeloff C.V, Hammer R. B, Stewart S. I, Fried J. S, Holcomb S. S, and McKeefry J. F, (2005). The Wildland-Urban Interface in the United States. *Ecological Application*, 15. 799-805.

[2] World Economic Forum: Global Risk Report. http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf Download: 27.01.2020.

[3] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. *Polgári Védelmi Szemle*, 14. DAREnet projekt Különszám (2022), pp. 116-131.

[4] Melinda Győri – Zsuzsanna Kerekes - Rhoda, Mensah – Ágoston Restás: Combustible parameters of native timber modificated by blokk wood method. *Védelem Tudomány,* 6. 3. (2021), pp. 107-124.

[5] Cordelia Fire Protection District: Fire Safety: https://www.cordeliafire.org/fire-safety/ Download: 06.03.2019.

[6] Nagy László - Rácz Sándor: A tűzoltásvezető feladatainak vizsgálata káresetnél, azok hatása, komplexitása, és időfüggése szempontjából. *Hadmérnök,* 13. 3. (2018), pp. 250-265.

[7] Varga Ferenc: Structural and operational model for volunteer fire brigades. *Hadmérnök*, 13. 2. (2018), pp. 345-359.

[8] Sereg Adrienn - Kerekes Zsuzsanna - Elek Barbara: Az erdők környezeti vegetációjának hatása a tűzesetekre, a megelőzés egyes lehetőségei. Védelem Tudomány, 4. 4. (2019), pp. 75-90.

Dóra Edelmann

The significance of John von Neumann's theories in contemporary fire protection

Abstract

The paper summarizes the fire safety related elements of the work of the Hungarian-born genius scientist, John von Neumann (1903-1957). It primarily presents his discoveries that we still encounter in the field of fire safety today, on the occasion of his 120th birth anniversary.
Keywords: John von Neumann, fire safety, cultural history, game theory, wave propagation, cellular automata, crowd movement, fire spread.

Introduction

The World knows the universal scientist under the name of John von Neumann, who is known by most people in his birthplace, Hungary, as the father of the computer, as Neumann János. However, his work was much broader than pioneering research in computer science. Algebra, logic, set theory, quantum physics, game theory, hydrodynamics, physics of waves and shock waves, economics, meteorology [1] [2] are just a few of the areas where Neumann's work had a groundbreaking impact.

Objective

The aim of the study is to highlight the areas and insights from the work of John von Neumann that are still in use today in the practice of fire protection design and in active research related to fire protection.

Method

The main method used in the preparation of the study was the so-called "snowball method," which enables the systematic and detailed exploration of relevant bibliographies.

Results

From the research of relevant literature, it can be concluded that at least the following elements of John von Neumann's work in the field of fire protection are actively applied today:

Game theory and the Monte Carlo method.

Neumann and Morgenstern's two-player [3], and later extended n-player game theory characterize the possible outcomes of different events and relate them to the strategies chosen by each player. Their groundbreaking approach places the outcomes on a measurement scale, so that positive results (gain) or negative results (loss) can be quantified. According to game theory, gain and loss can be interpreted as the usefulness or uselessness of certain things, and used to model conflicts of interest and complex decision-making processes. Going beyond the theoretical limits of mathematical logic, the practical application of the theory was first observed in the fields of economics and political decision-making. Similarly, in fire protection, it provided a theoretical foundation that is suitable for solving strategic situations and measuring the economic implications of fire consequences.[4]

In fire protection, game theory appears not only to support decision making in strategic situations, but also in describing the movement of crowds of people and simulating evacuation processes. According to these theories, emergency evacuation is primarily a problem of finding a way out, where individuals focus on finding exits. In models using non-cooperative game theory as a template, individuals interact with each other to achieve their own goals, thus an optimal strategy can be determined.[5] Evolutionary game theory (EGT) models,[6] on the other hand, focus more on the dynamics of strategy switching.

John von Neumann, Enrico Fermi, and Stan Ulman [7] developed the Monte Carlo method in the 1940s, which was applied to simulate evacuations and validate various models.[8][9]

Detonation

The wave propagation-related research of John von Neumann, among others [10] also addressed the description of phenomena such as hydrodynamic waves [11], wave reflection [12] [13] and detonation [14].

The fact that his discoveries were ahead of his time is demonstrated by the active investigation of the ZND (Zeldovich-Neumann-Döring) detonation model, based on his theory, which serves as an important theoretical foundation for explosion protection. [15] In a recently discovered unpublished manuscript, Neumann János explores the effects of explosive accelerators and the possibilities of sustainable detonation, which provides valuable historical documentation on the state of hydrodynamic research during and after World War II. [16]

Cellular automata (CA)

John von Neumann was already interested in the idea of self-reproducing automata in the early 1940s.[17] According to his theory, the self-reproducing machine interprets and copies the incoming information, uses the slightly modified (improved) information to build a new machine, and then passes it on. The process is analogous to the double information utilization of DNA, which was discovered years later in 1953. One of his early theories, however, was supplemented with the cell-based concept typical of living systems, suggested by Stanislaw Ulam in his later years, and became a mathematical model suitable for simulating complex systems. The model follows the logic of biological evolution and reproduction, and is composed of elements called cells, each of which has a defined state. The cells are arranged in neighboring relationships with other specified cells.

The individual cells, organized in a multi-dimensional lattice, change their states at each time step according to predetermined rules, which are also influenced by the states of neighboring cells. The original Neumann cellular automaton has 29 possible states for each cell, and the spatial relationships are arranged in the directions of up, down, left, and right in a two-dimensional plane. [18]

The definition of a CA (cellular automaton) is given by the following quadruple:

CA=(S, N, P, f), where:

S is the cell space

N is the neighborhood relation

P is the state function

f is the local transition function.

Indeed, the basic idea of cellular automata has been proven useful in practice over the decades, both in original and modified versions, actively applied in various fields of science. It can be found in more than 1000 scientific articles every year.

The use of cellular automata appears in various areas of fire safety. The procedure can be used to model the spread of forest fires,[19] the development of a fire front. The complex interplay of factors such as topography, land use, vegetation type and density, inhomogeneous terrain, humidity, firefighting efficiency, or dynamic wind flow conditions can be modeled using the procedure.

Cellular automata can also be used to model fire spread in the built environment, including residential areas and historic buildings.[20]

Since the model is extremely complex and can be used to describe real systems, it has become increasingly popular in recent years for studying pedestrian movements and mass evacuations.

Cellular models developed for simulating evacuations before 2008 could be divided into two main groups[21]:

Models based on interactions between the environment and pedestrians

Models based on interactions between pedestrians.

While models belonging to the first group were generally characterized by the study of the effects of different environmental geometries, obstacles, and exit widths on evacuation time, the second group mainly studied the frictional effects of pedestrian behavior. Recent published studies typically focus on modeling the combined effects of as many factors as possible, [22]

testing the developed software, or creating new software.

Lattice Gas (LG) models are also present among pedestrian motion simulations. These theories were developed based on the analogy of cellular automata (CA) models, using the discretized version of the Boltzmann transport equation to model motion. In the lattice gas models used in pedestrian motion simulations, each cell of the lattice can be occupied by one pedestrian according to the model, and their movement is described using statistical or probabilistic methods. The values in each cell are synchronized and updated at each time step based on the values in neighboring cells.

Conclusion

The study was prepared on the occasion of the 120th anniversary of the birth of John von Neumann, highlighting the theories used in fire protection planning today, three of which were recognized for their direct application.

References

[1] Szász, Domokos: John von Neumann, the Mathematician. In: *Mathematical Intelligencer* Bd. 33 (2011), Nr. 2

[2] Macrae, Norman ; York, Herbert F.: John Von Neumann: The Scientific Genius Who Pioneered the Modern Computer, Game Theory, Nuclear Deterrance, and Much More. In: *Physics Today* Bd. 46 (1993), Nr. 10

[3] von Neumann, J.: Zur Theorie der Gesellschaftsspiele. In: *Mathematische Annalen* Bd. 100 (1928), Nr. 1

[4] Ramachandran, G.: Measuring Fire Consequences in Economic Terms. In: John R. Hall, Jr. , PhD. (Hrsg.): *SFPE Handbook of Fire Protection Engineering*. Third. Massachusetts : National Fire Protection Association, Inc. One Batterymarch Park Quincy, Massachusetts 02269, 2002, S. 579–592

[5] Lo, S. M. ; Huang, H. C. ; Wang, P. ; Yuen, K. K.: A game theory based exit selection model for evacuation. In: *Fire Safety Journal* Bd. 41 (2006), Nr. 5

[6] Ibrahim, Azhar Mohd ; Venkat, Ibrahim ; Wilde, Philippe De: The impact of potential crowd behaviours on emergency evacuation: An evolutionary game-theoretic approach. In: *JASSS* Bd. 22 (2019), Nr. 1

[7] Benov, Dobriyan M.: The Manhattan Project, the first electronic computer and the Monte Carlo method. In: *Monte Carlo Methods and Applications* Bd. 22 (2016), Nr. 1

[8] Bellomo, N. ; Gibelli, L.: Behavioral crowds: Modeling and Monte Carlo simulations toward validation. In: *Computers and Fluids* Bd. 141 (2016)

[9] Tamang, Nutthavuth ; Sun, Yi: Application of the dynamic Monte Carlo method to pedestrian evacuation dynamics. In: *Applied Mathematics and Computation* Bd. 445 (2023)

[10] Beebe, Nelson H F: A Complete Bibliography of Publications of John von Neumann. In: , 2015

[11] von Neumann, John: *Proposal and analysis of a numerical method for the treatment of hydrodynamical shock problems.*, 1944

[12] von Neumann, John: *Oblique reflection of shocks*. Washington, 1943

[13] von Neumann, John: *Refraction, intersection, and reflection of shock waves.* Washington, 1945

[14] von Neumann, John: *Theory of Detonation Waves*. Princeton, New Jersey, 1942

[15] Jomaas, Grunde: Fundamentals of Premixed Flames. In: , 2016, S. 373–395

[16] Knoedler, Molly Riley ; Kostas, Julianna C. ; Hogan, Caroline Mary ; Kerkhoff, Harper ; Topaz, Chad M.: An unpublished manuscript of John von Neumann on shock waves in boostered detonations: historical context and mathematical analysis. In: *Archive for History of Exact Sciences* Bd. 75 (2021), Nr. 1

[17] von Neumann, John: The general and logical theory of automata. In: *Cerebral Mechanisms in Behavior*. 1st. Aufl. New York : John Wiley and Sons, New York, NY, USA; London, UK; Sydney, Australia, 1941, S. 1–41

[18] Neumann, János: *Theory of Self-Reproducing Automata*. Burks, Arthur W. Urbana and London : University of Illinois Press, 1966

[19] Tinoco, Claudiney R ; Ferreira, Heitor F ; Martins, Luiz G A ; Oliveira, Gina M B: Wildfire Simulation Model Based on Cellular Automata and Stochastic Rules. In: Chopard, B. ; Bandini, S. ; Dennunzio, A. ; Arabi Haddad, M.

(Hrsg.): *Cellular Automata*. Cham : Springer International Publishing, 2022 — ISBN 978-3-031-14926-9, S. 246–256

[20] Ma, Jun ; Xiao, Chunbei: Large-scale fire spread model for traditional Chinese building communities. In: *Journal of Building Engineering* Bd. 67 (2023)

[21] Zheng, Xiaoping ; Zhong, Tingkuan ; Liu, Mengting: Modeling crowd evacuation of a building based on seven methodological approaches. In: *Building and Environment* Bd. 44 (2009), Nr. 3

[22] Gao, Dong Li ; Ming Lee, Eric Wai ; Lee, Yiu Yin: Integration of cumulative prospect theory in cellular automata model for building evacuation. In: *International Journal of Disaster Risk Reduction* Bd. 74 (2022)

Gergő Érces - Sándor Rácz - Gyula Vass - Ferenc Varga

Robustness of the fire safety network in buildings

Introduction

Today's modern buildings are made up of complex and complicated systems of construction, space, materials, etc. Natural disasters caused by extreme weather events, climate change or human use behaviour are putting increasing strain on the resilience of our buildings. In many cases, these impacts push the limits of the resilience of buildings, pushing their resilience to the limit. In order to ensure long-term sustainability, the protective network structure of buildings must be built up to the appropriate level of resistance to the damaging effects of various mechanical, hydrological, fire, etc. forces. In the present current research, the authors have investigated one of the most dangerous damaging effects, fire resistance. They sought to answer the question of what vulnerability limit states result from fires affecting buildings. They investigated the technical characteristics of the fire safety network of buildings that increase the fire resilience of buildings as a complex and dominant focal point. In this research, the authors used network science methods to analyse the vulnerability factors of buildings and the robustness of buildings. Their aim is to develop a methodology for optimal and long-term sustainable fire resilience of buildings.

Objective

The researchers aim to test the main objectives of the European Fire Safety Action Plan in the fire safety network. In the fire safety network model, the researchers aim to build an ordered safety network by investigating robustness, in which the degree of orderliness is directly proportional to the degree of robustness, so that the vulnerability and resilience of a given building to fire can be analysed using an exact methodology.

Methods

The researchers used a method known in network science as robustness testing. In network science, robustness is a measure of the resilience of a network to the various disturbances and failures that can occur during a fire. It means that a robust network is able to maintain its operation and preserve its performance against fire, even if some of its elements are inherently faulty (e.g. a fire door that has been wedged open) or have failed (a wall that has lost its integrity) during a fire. The design and operation of robust networks can use a variety of techniques, e.g. building redundancy into the network architecture, providing autonomy and self-reconfiguration capabilities. The importance of fire network robustness in modern digital fire protection is increasing as fire networks become more complex and comprehensive, and their reliability and availability play a critical role in fire safety. The method is used to identify the harmful effects resulting from the orderliness of the network, to which the network science method of the given protection structure can be applied. Based on the foregoing, the robustness of the system can be analysed, i.e. vulnerable elements can be detected and identified and the degree of attack tolerance can be assessed. As a result of the analysis, the network's key focal points, which have a decisive influence on fire safety, can be identified.

Hypothesis

The researchers hypothesized that the orderliness of fire protection systems in a building's fire safety network is directly proportional to the degree of robustness. The more disordered a building's fire protection structure, the more vulnerable the protection network, i.e. the less resilient the building is to fire.

European Fire Safety Action Plan

The European Fire Safety Alliance's European Fire Safety Action Plan identifies 6 priority focus areas with a total of 10 action points:

1. Growing vulnerable community

Action 1: Improving fire safety in vulnerable communities and those most in need

2. Dangerous reduction in escape time

Action 2: EU rules on refractory equipment

Action 3: Provide residential buildings with fire alarms and extinguishing systems

Action 4: Evaluate and improve the performance of lower ignition propensity (LIP) cigarettes

3. Energy transition

Action 5: Address fire risks associated with new forms of energy and ensure regular inspections

4. Awareness of fire safety

Action 6: Encourage and support the activities of fire and rescue services in relation to community fire safety projects

Action 7: Stimulate scientific research to improve people's fire safety behaviour and increase the effectiveness of fire safety

5. EU-wide data on residential fires

Action 8: Actual collection of data on fires at European level and their integration into statistics, Eurostat

6. EU-wide communication and collaboration

Action 9: Focus on knowledge exchange and innovation on fire safety

Action 10: Better cooperation between Member States and industry on market surveillance.

The fire safety network has been designed by the researchers taking into account the above action plan.

The model maps three main problem areas:

I. Social problems

II. Natural problems

III. Technical problems

The model aims for complexity and therefore targets the intersection of the three main problem areas for solutions.

Vulnerability analysis

The robustness of a fire protection system shows whether it will maintain its basic functions in the event of internal and external failures. So, by robustness we mean the ability of a fire protection system to perform its basic functions even if some of its nodes are missing. This is one of the most important principles to be achieved in terms of the robustness of a fire protection network. This principle is essentially applicable to passive fire protection.

The percolation theory, which points out that cluster size p is unlikely to change uniformly, i.e. the change cannot be predicted unambiguously, helps to test robustness. This is typically true for a fire. For example, consider a forest fire and examine its spread. The Molloy-Reed criterion allows the calculation of the percolation threshold of an arbitrary fire protection network. Resilience shows the ability of a fire protection system to adapt to external and internal failures by changing its operation in order to maintain its functionality. This capability is therefore a dynamic property that plays an important and indispensable role in the field of active fire protection.

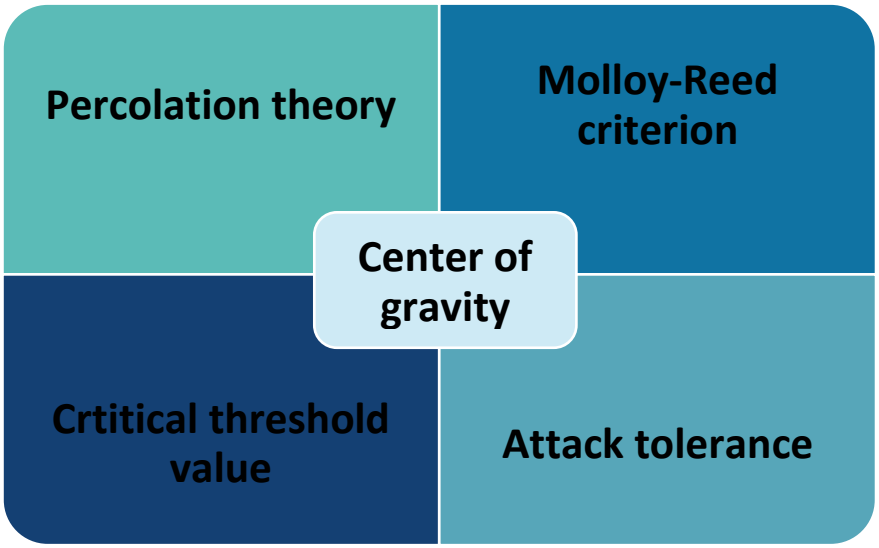


Figure 1 - Center of gravity (made by the authors).

In order to maintain the expected level of safety, a stable fire protection equilibrium, another very important concept needs to be understood and applied, especially for large and complex systems. This is the concept of redundancy, which means that protection components or safety functions are present in parallel, which can replace a missing component or function if necessary. For example, in the case of tall buildings, a duplicated fire water main. Summarising the above, the focal points of the fire safety network can be identified, which have a decisive influence on the fire safety situation of a given building.

Fire resistance of your building

The fire resistance of buildings can be described by time criterion values. They must be resistant to fire for a certain period of time and to a certain extent. They must function in a sustainable way for a certain period of time, providing the

expected level of safety, and therefore can only be destroyed to a certain extent. The technical solutions for this resilience can be achieved in a complex way by performance-based engineering solutions.

The resilience to fire in this fire protection network depends on the degree of orderliness of the protection elements that make up the network, i.e. the degree of orderliness. The entropy of the fire protection network, i.e. the degree of disorder, increases with the disorder of the protection elements within the network. For the above reasons, it is therefore necessary to build a well-identified and properly ordered fire protection network, which can be achieved in the most holistic way by using building information modeling and computer simulations.

Results

The researchers found that a fire safety network with near-zero entropy can be constructed, in which the vulnerability of the fire safety network can be investigated and the location of the centroids that have a decisive influence on the fire safety situation can be identified. In the above studies, the authors have demonstrated that the orderliness of fire protection systems in a building's fire protection network is directly proportional to the degree of robustness.

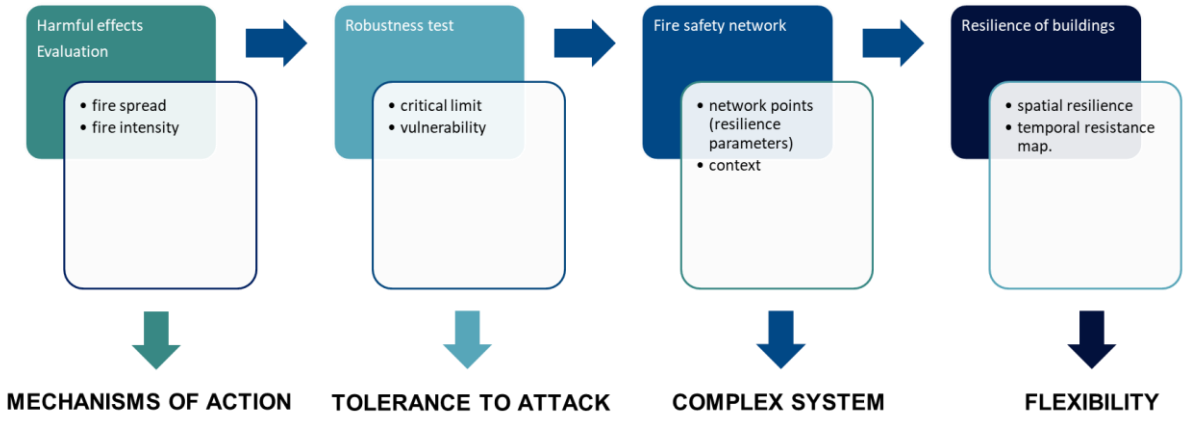


Figure 2 – Summary conclusions of the resilience of buildings. Mady by the Authors.

Conclusion

In their research, the authors have demonstrated that by using network science and network research methods, the system elements influencing the fire safety situation can be analysed and evaluated in a complex way, and therefore this methodology can be used to establish a new, more comprehensive and holistic fire prevention methodology that integrates the fields of social science, natural science and engineering. By further exploring the above, an exogenous performance-based design methodology can be developed.

References

[1] Barabási, A.-L., Albert, R. (1999) Emergence of scaling in random networks, Science, 286:509-512

[2] Albert, R., Jeong, H., Barabási A.-L. (2000) Attack and error tolerance of complex networks, Nature, 406:378

[3] Cohen, R., Havlin, S. (2010) Complex Networks: Structure, Robustness and Function, Cambridge University Press, UK

[4] Ágoston, Restás ; Miguel, Almeida ; Saeid, Lotfi ; László, Bodnár ; Domingos, Xavier Viegas Basic rules for developing fire sprinkler system in the forest

[5] Barrat, A., Barthélemy, M., Vespignani, A. (2012) Dynamical Processes on Complex Networks, Cambridge University Press, UK

[6] Barabási, A.-L. (2016) Network Science, Libri, pp.: 297-321. ISBN: 978-963-310-787-4.

Máté Fodor - Sándor Rácz

The status and potential for improvement of on-scene first aid skills of intervention firefighters and the importance of disaster medic training

Abstract

Today's diverse, ever-changing environment, with its many different sources of danger, presents a wide variety of challenging incidents that confront the firefighters in the field every day. In many situations, one or more lives are at risk. In the vast majority of cases, the firefighters are the first to come into contact with the person in distress, and because of the danger of the scene and the lack of protective equipment, paramedics are unable to intervene, making the intervention firefighter the most important element in saving lives in a dangerous area. Rapid, confident and professional care can greatly increase the chances of survival, recovery of the injured and the effectiveness of the intervention. The aim of this research is to assess the first aid competence of firefighters on the scene of an incident and to identify ways to improve this competence by reviewing the firefighter training system, with a particular focus on health and rescue skills.
Keywords: first aid, disaster medic, firefighter training, rescue

Introduction

In Hungary, the Western-style paramedic system has not yet taken root. There are some local, individual attempts, such as the now defunct doctor service, but there is no unified regulation. Firefighters working in the field have widely differing first-aid skills and lack the necessary equipment to provide care, so they cannot be expected to provide confident and competent casualty care.

Objective

The qualified health service is not always able to provide physical assistance due to their protocol and their arrival may be delayed due to various obstacles. The aim of the research was to prove the need to develop a training system aimed at improving and maintaining the level of rescue and medical activities of firefighters on the scene of a fire, since in many cases acute life-saving can only be carried out by the interventionists.

Methods

To prove the hypotheses, it was necessary to conduct research that would give an approximate picture of the ability of the intervening firefighters to rescue the injured. During the research, authors created two different questionnaires to compare the qualities of firefighters with those of civilians. They used the self-assessment of the questionnaires to examine the results. In the first round, they were interested in the skills of the general public, so this form was filled in by a larger number of people from a mixed population. The second questionnaire was aimed at a narrower group, namely firefighters working in the operational area of Nógrád County. Projected to the year 2022, we also examined the incidents in the county where injury or injuries had occurred and, referring to statistical data,

analysed whether there were, and if so, what differences there were between the response of fire brigades and that of ambulance staff.

Results

In the review of firefighter training in the past and present, we have found that there is little emphasis on first aid for the injured, and that training and therefore the firefighter's position is limited to rescuing the injured from a dangerous environment. There has already been an initiative to address this through the Disaster Medic programme, but it was short-lived.

The results of the questionnaires show that firefighters working in the operational area, by virtue of their profession, are much more confident than a civilian citizen in their ability to provide medical care for various injuries. This is mainly due to the experience gained in their work. They have been called to the scene of many injury incidents and have thus gained greater confidence in their ability to provide casualty care. The results of the responses to the questions suggest that the colleagues do not have the necessary first aid training and knowledge to carry out medical care in a hazardous area with full confidence, by their own admission. Their comments also suggest the need for training, continuous practice, and the purchase of life-saving equipment and specialist medical equipment, and the confident use of such equipment, in order to ensure the most successful recovery from injury incidents.

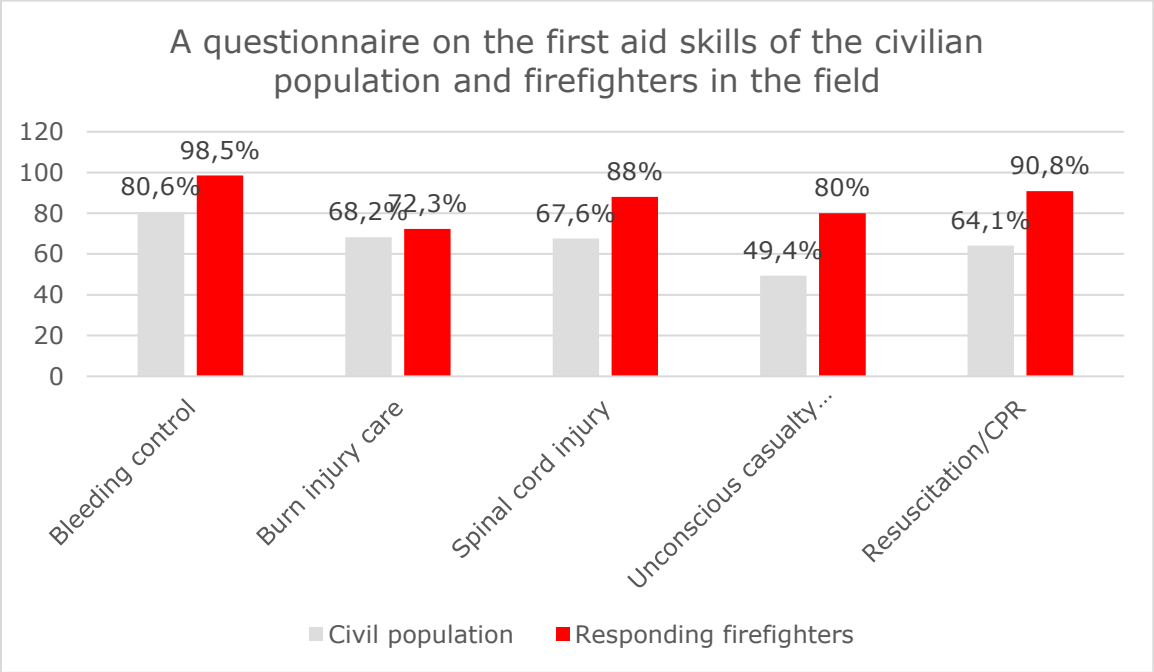


Figure 1 - Comparison of the first aid capabilities of the civilian population and the intervening firefighters Source: own figure.

During the research we studied the accidents in 2022 in Nógrád County, where some kind of minor or major injury occurred. In 39,8 % of the cases the paramedics were already on the scene, while in 43,5 % of the cases the firefighters arrived earlier. In the remaining 16.7%, either they approached the casualty together, or the scene commander requested assistance, or the arrival time of the paramedics could not be determined from the casualty record. In some cases there was a difference of less than 1 minute between the arrival times, which I marked

as 0 in my analysis, but in one extreme case there was a difference of 48 minutes, these two values being the minimum and maximum values for the sample studied. Examining the average of the series, it can be seen that on average the firefighters who responded to the scene of the damage arrived 7.6 minutes earlier.

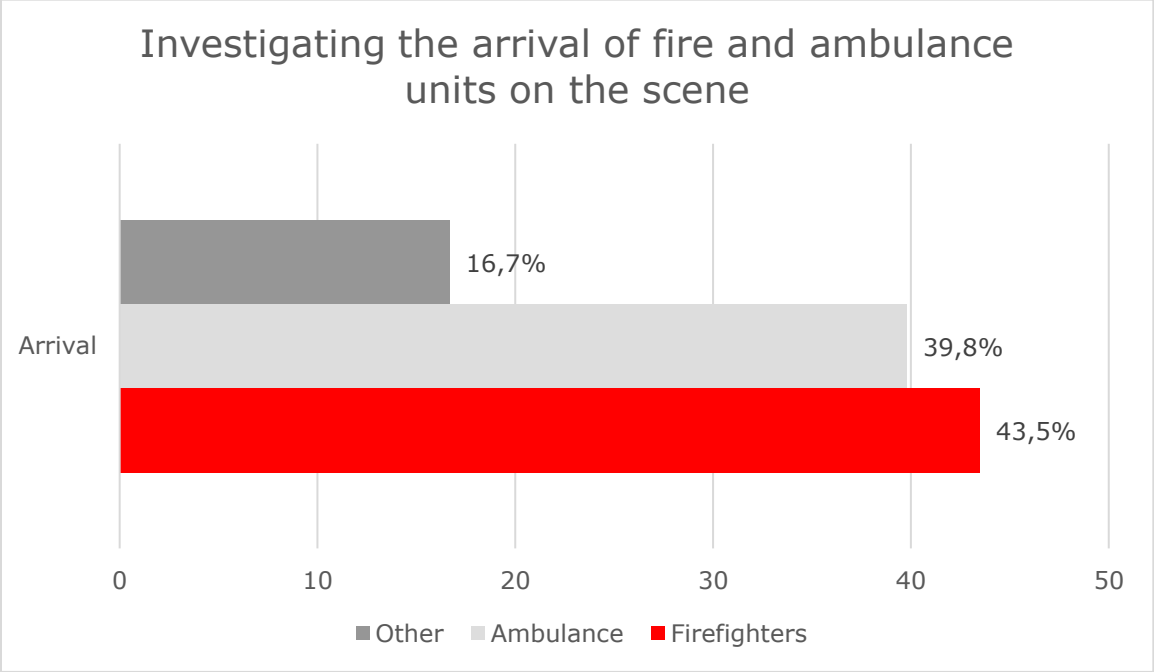


Figure 2 - Arrival times Source: Edited by the Authors.

Summary

The results support the hypothesis that the arrival of the ambulance service may be delayed due to various obstacles or they may not be able to provide physical assistance to the intervening colleagues, therefore only the direct intervention firefighters have the possibility to provide rapid life-saving and first aid, and in order to do this confidently, an appropriate level of knowledge and medical equipment must be installed on the vehicles. With continued practice, they would gain sufficient confidence to be able to apply this at a skill level when rescuing casualties in the field of operations. In my opinion, this would be best done by re-launching the Disaster Medic programme and incorporating it into all cycles of the local first aid training plan.

References

[1] Bodnár László – Debreceni Péter: Examination of wildfires in Hungary-current challenges and answers. In: László, Bodnár; György, Heizler (szerk.) 2nd Fire Engineering & Disaster Management Prerecorded International Scientific Conference Védelem online – cooperated with the University of Public Service : Book of extended abstracts. Budapest, Magyarország : Védelem online (2022) 201 p. pp. 75-78.

[2] Cziva Oszkár: Doctors in Budapest FB are not paramedics. Védelem. 2010.

[3] Gubicza József, Péter Zsolt: A kárhelyszíni egészségügyi ellátásra történő felkészítés rendszere, a disaster medic képzési struktúra kialakítása, hasznosíthatósága. Védelemtudomány- 2016. 4. szám.

[4] Hadnagy Imre József: A tűzmegelőzés fejlődése napjainkig. Tűzoltó Múzeum évkönyve 8. Budapest, 2007.

[5] Keresztes Dóra, Woth Gábor, Nagy Bálint János, Farkas József, Németh Zsuzsanna, Maróti Péter, Rendeki Mátyás, Rendeki Szilárd: A kárhelyszíni elsősegélynyújtás- A disaster medic képzés első tapasztalatai tűzoltók körében. Védelem online. 2017.

[6] Kirov Attila: A disaster medic a tűzoltók képzési palettáján. Tanulmány. Védelem online. 2018.

[7] Papp Antal, Berki Imre, Horváth Galina Valgyimirovna: The history of Hungarian firefighter training from the beginning tot he change of regime. Védelem Tudomány- VII. évfolyam, 1. szám. 2022.

[8] Rácz Sándor: A beavatkozói hatékonyság növelése a tűzoltások és műszaki mentések során. Phd értekezés. Budapest. 2019.

[9] Rácz Sándor: Tűzoltók kiképzésének fejlesztési lehetőségei. *Védelem Tudomány* – III. 4. (2018). pp. 182-199.

[10] Varga Ferenc: Structural and operational model for volunteer fire brigades. *Hadmérnök*, 13. 2. (2018), pp. 345-359.

[11] Elek Barbara - Hák Viktor - Kovács Gábor: Ipari hulladéktározók kockázatának vizsgálata. Hulladék Online, 3. 2. (2012), Paper: Elek, Hák, Kovács , 12 p.

Marek Hodálik - Péter Pántya - Sándor Rácz - Gergő Érces

Gasoline as a fire accelerator – weathering process of residues

Abstract

The article deals with the issue of identifying weathered residues of ignitable liquids (ILs) in fire residues, which is a key step in fire investigation. ILs are subject to degradation processes over time, such as weathering and microbial degradation. After a varying length of weathering time (0-360min) in the carpet fibers, residual gasoline compounds were determined using the gas phase extraction method (headspace) in conjunction with gas chromatography and mass spectrometry (HS-GC-MS). The biggest changes were manifested in the reduction of the intensity of the most volatile compounds (alkyl alkanes). In the case of toluene, as a representative of the most volatile group of hydrocarbons, there was a decrease from the reference sample (USL0) in the 6-hour weathered sample (USL 360) by 91%. Almost negligible changes (14% fluctuation) in the determined amount appear in the group of alkyl derivatives of benzene (trimethylbenzene), which is also considered as indicators of the presence of gasoline in the samples. Conversely, heavier compounds (e. g. naphthalene) show an increase in signal intensity by 52%. From the results it is clear that after the first 6 hours, the gasoline significantly loses its intensity, and it becomes more difficult to identify. The results indicate the need for rapid sampling and subsequent analysis of fire residues. The main goal of the paper is to determine changes in the composition of selected gasoline compounds in cotton carpet samples due to weathering.
Keywords: Fire accelerator, fire debris, fire investigation, gasoline, HS-GC-MS

Introduction

Intentionally started fires are most often started with the use of ignitable liquids (ILs), which are used not only to start an immediate fire, but also to accelerate the speed of burning and the spread of fire [1,2]. Due to the heat generated during a fire, the remains of fire accelerators are exposed to various degradation processes, which mainly include weathering [3,4]. The weathering process of ILs represents a faster evaporation of the most volatile compounds. Weathering and exposure to high temperatures change the chemical composition of fire accelerator residues in samples from the fire site, which leads to modification of the analytical signal and subsequently to problems in fire investigation [5].

The residual more volatile compounds present are consequently present below the limit of determination. At the temperatures reached during a fire, due to the weathering process, it is difficult to detect the presence of even less volatile, more stable compounds such as naphthalenes and higher alkylbenzenes [6,7]. The impact of the lack of identified compounds is subsequently reflected in chromatograms that differ from those obtained from neat samples. There is a change in the relative amounts of the components in the mixture, which make it difficult for the analyst to interpret the results [8].

Samples of debris recovered after a fire provide a wide range of evidence to fire investigators. If the fire site is largely destroyed, it is possible that little evidence if any will be collected [2]. On the other hand, the ASTM standards state that when interpreting the results of the analysis for the correct determination of the presence of an ILs at the fire scene, it is sufficient to identify the marker

compounds that belong to a specific IL. As stated by the ASTM E1618 standard, to claim that the sample contains traces of gasoline, the presence of markers such as 1,3,5 trimethylbenzene; 1,2,3 trimethylbenzene and etc. [9].
In real fires, it is very important to take samples from the fire site as soon as possible because a fire can cause various changes in the gasoline profile due to uncontrollable factors, such as uneven distribution of gasoline, burning rate, fire intensity, air flow, fire spread, which affect the amount of accelerant residues obtained from fire debris.

Material and Methods

A woven carpet made of 100% cotton was used as a matrix for capturing gasoline. The carpet was cut into samples with dimensions of 5×5 cm, to which 5 ml of Natural - 95 gasoline from the local petrol station (Slovnaft) was added. The carpet samples were then ignited and allowed to burn for 45 seconds, followed by extinguishing the fire by covering (removing oxygen). From each carpet sample, 3 carpet fibers were taken one piece each from two edges and one from the central part. Carpet fibers were sampled at hourly intervals, with additional intervals of 15, 30 and 45 minutes. Samples were marked with the abbreviation USL (unburnt Slovnaft) with the numerical data that represents the time during which the samples were exposed to weathering.

The analytical determination was based on the ASTM E1388-17 and ASTM E1618-14 methods. The remaining volatile compounds were obtained by the gas phase extraction method (static HS). The gas phase was analyzed by gas chromatography with mass detection (GC-MS). A Headspace Autosampler 7697A (Agilent) with an HP7890A Gas Chromatograph (Agilent) and a VL MSD 5975C Mass Spectrometer (Agilent) were used. Peaks were identified using mass spectra. The identity of each target compound was confirmed by searching the NIST library mass spectrum. A total of 70 samples were analyzed, with 5 replicates of each time interval supplemented with reference samples of neat gasoline and neat carpet.

Results and Discussion

In the study, we focused on the comparison of selected gasoline compounds: toluene, 1,2,3-trimethylbenzene and naphthalene. By comparing the peak areas of the selected compounds, the change was manifested in a decrease in the intensity of the most volatile compounds (alkyl alkanes). The analytical signal intensity of toluene (Fig.1) decreased by 91.64% from the reference unweathered sample (USL0) to the sample weathered for 6 hours (USL360).

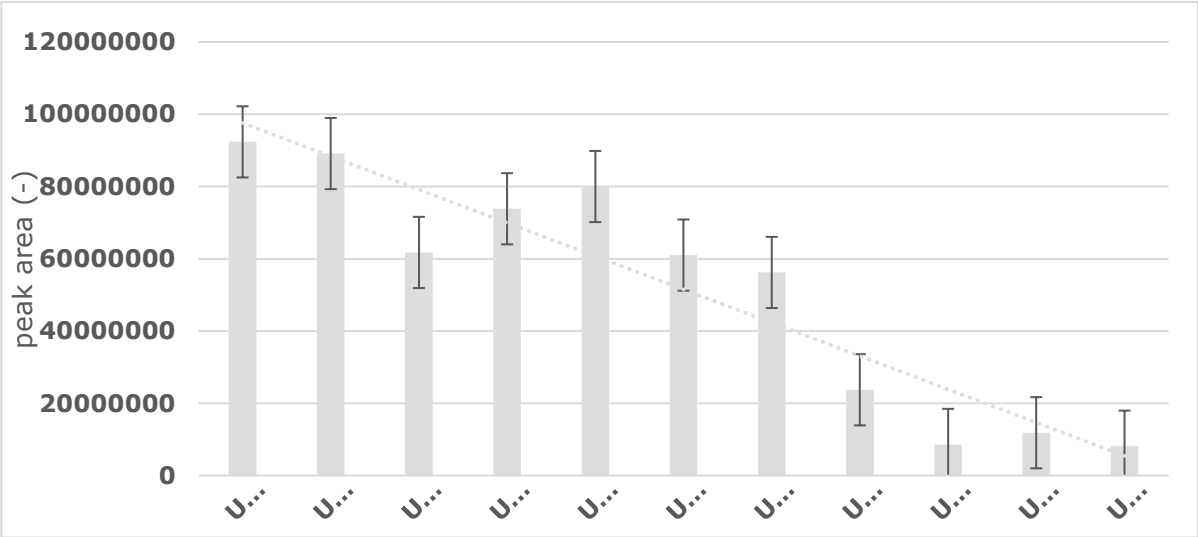


Figure 1 - Changes in the intensities of the toluene analytical signals at different weathered samples.

The change occurs after about 5 minutes (retention time), where the differences in this area are no longer so marked. In this area, the individual intensities stabilize for different sample variants. Figure 2 shows the compound 1,2,3-trimethylbenzene (TMB), which is also considered as an indicator of the presence of gasoline. As can be seen, there were no significant differences in the intensity of this compound during weathering after 6 hours. 1,2,3-TMB increased USL360 by 14.41% over the reference sample, which is not a significant difference. Figure 3 shows the area of the chromatogram with a retention time of 15 minutes where the most stable compounds occur. A representant of this category of compounds with the highest vapor pressure is e. g. naphthalene. As can be seen, the intensity of naphthalene increases over time. If we compare the reference sample (USL 0), or the sample weathered for 15 minutes (USL 15) with samples weathered for 5 hours (USL 300), or for 6 hours (USL 360), the naphthalene intensity increased by approximately 52.6%.

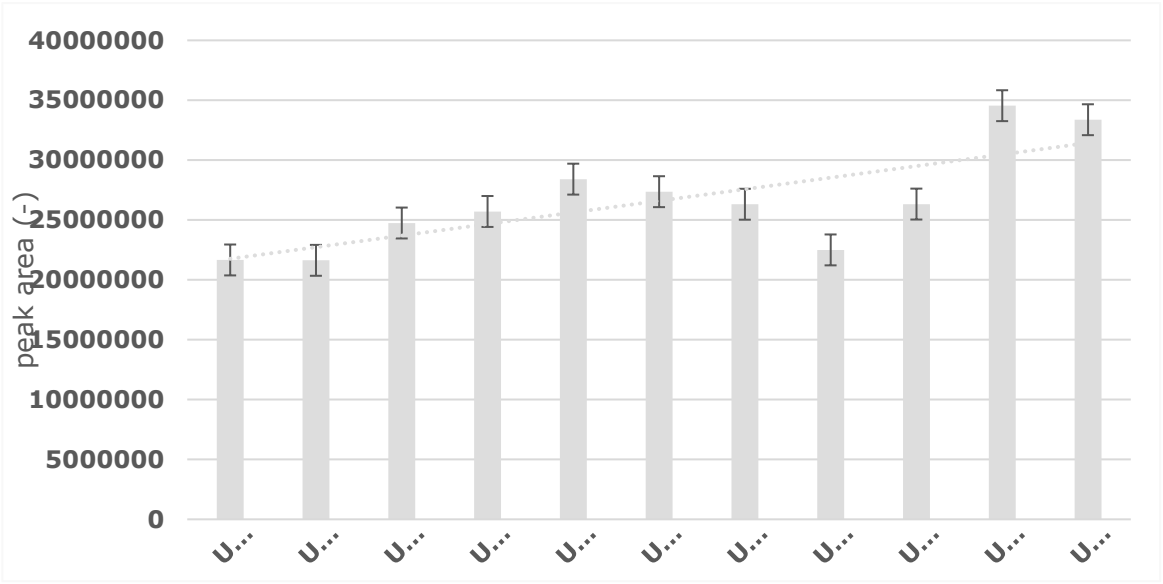


Figure 2 - Changes in the intensities of the 1,2,3 –TMB analytical signals at different weathered samples.

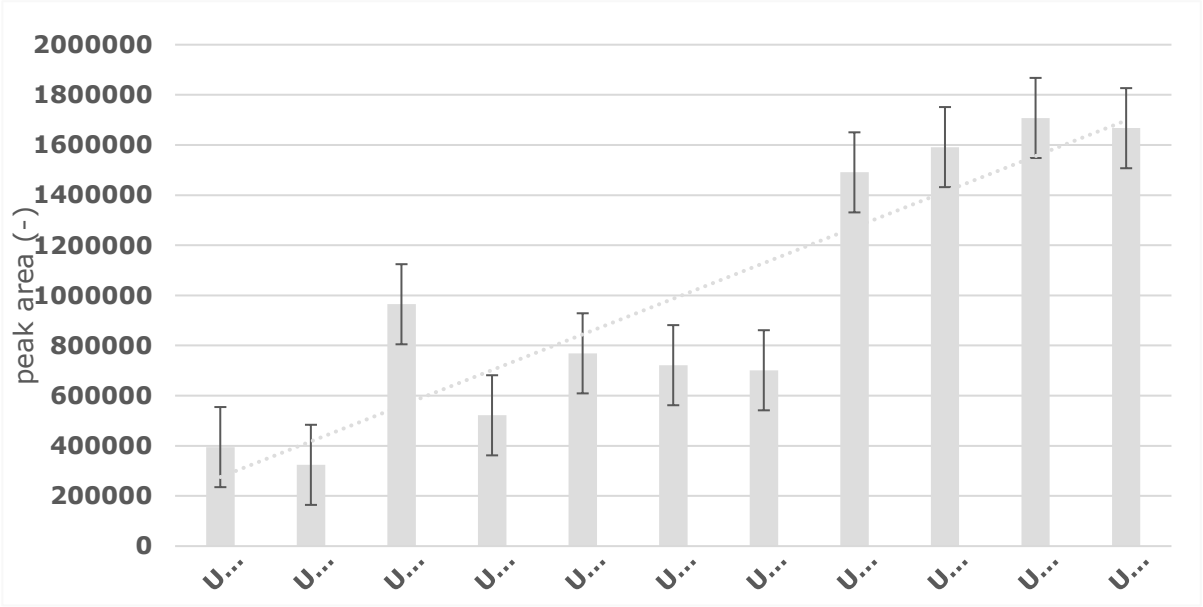


Figure 3 - Changes in the intensities of the naphthalene analytical signals at different weathered samples.

Conclusions

The analysis showed that the most susceptible compounds for weathering are the most volatile hydrocarbons. The largest difference in the intensity changes of the selected compounds can be observed after four or five hours. Over the course of six hours, the compounds lose significantly in intensity. On the other hand, the heaviest hydrocarbons increased significantly in intensity after six hours, and the peaks of these compounds increased.

In conclusion, it should be noted that the analysis results proved that time has a significant effect on the determinability of gasoline in fire debris samples. On the other hand, it is important from a practice point of view to perform comparative analyzes of samples that have been weathered for various lengths of time with

neat samples, as the correct interpretation of laboratory analysis results plays a key role in fire investigation.

Acknowledgments

The submitted work was supported by the Agency for Research and Development based on contract no. APVV-17-0005 (50%) and Scientific Grant Agency VEGA, project 1/0454/20 (50%).

References

[1] Dhabbah, A. M. 2018. Detection of petrol residues in natural and synthetic textiles before and after burning using SPME and GC-MS. Australian Journal of Forensic Sciences 52(2):1-14. DOI: 10.1080/00450618.2018.1510029

[2] Lim, P. W., Abdullah, A. F. L., Chang, K. H. 2018. Forensic Gas Chromatography Analysis of Time Elapsed Gasoline in Fire Scene Investigation. Malaysian Journal of Analytical Sciences 22(1):72-79. DOI: 10.17576/mjas-2018-2201-09

[3] Monfreda, M., Gregori, A. 2011. Differentiation of Unevaporated Gasoline Samples According to Their Brands, by SPME–GC–MS and Multivariate Statistical Analysis. Journal of Forensic Sciences 56 (2): 372-380. DOI: 10.1111/j.1556-4029.2010.01644.x

[4] Turner, D. A., Williams, M., Sigman, M. A., Goodpaster, J. V. 2018. A comprehensive study of the alteration of ignitable liquids by weathering and microbial degradation. Journal of Forensic Sciences 63:58–65. DOI:10.1111/1556-4029.13527

[5] Aliaño-González, M. J., Ferreiro-González, M., Barbero, G. F., Ayuso, J., Palma, M., Barroso, G. C. 2018. Study of the weathering process of gasoline by eNose. Sensors 18:139. DOI:10.3390 /s18010139

[6] Willis, I. C., Fan, Z., Jackson, G. 2020. Weathering of ignitable liquids at elevated temperatures: A thermodynamic model, based on laws of ideals solutions, to predict weathering in structure fires. Forensic Chemistry 18:100215. DOI:10.1016/j.forc.2020.100215

[7] Hondrogiannis, E. M., Newton, C. H., Alibozek, R. 2019. Determining the method threshold of identification via gas chromatography-mass spectrometry of weathered gasoline extracted from burnt nylon carpet. Journal of Forensic Sciences 64(4):1160-1168. DOI:10.1111/1556-4029.13983

[8] Baerncopf, J. M., McGruffin, V. L., Smith, R. W. 2011. Association of ignitable liquid residues to neat ignitable liquids in the presence of matrix interferences using chemometric procedures. Journal of Forensic Sciences 56(1):70–80. DOI: 10.1111/j.1556-4029.2010.01563.x

[9] ASTM Standard E1618, 20061, Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography–Mass Spectrometry, ASTM International, West Conshohocken, PA, 2006

Kristóf Gyula Holczer – Péter Pántya – Rudolf Jambrik

Investigation of firefighting interventions, techniques and saving of museum values in the event of fires in cathedral and church buildings. In the crosshairs: the fire at Notre-Dame

Abstract

What experiences can the Notre-Dame fire give to fire protection and the firefighters who intervened? How can the decision-making of the fire chief affect successful fire fighting? Why can't aerial firefighting always be used? To what extent can the use of fire retardant help the work of the interveners? Protecting the bells in a church / cathedral building is an important task. To what extent can aerial reconnaissance (use of drones) help the success of firefighting?
Keywords: Notre-Dame, museum values, fire

Introduction

Notre-Dame was built 800 years ago, it is a unique and wonderful building [1]. New technology even then, thin limestone wall, external support arches [2-5].

The floor of the building: ribbed vault, giant stained glass windows Main historical events:

- 1239- Christ's crown of thorns arrives at Notre-Dame

- 1804 Coronation of Napoleon,

- 1831 Victor Hugo Notre-Dame in Paris

The fire occurred on April 15, 2019, prior to which renovation work was carried out on the hussar tower. The fire affected the entire roof structure of the cathedral. There is a large amount of dry combustible material on site [5-8].

Objective/Methods

Travel to the location to gain experience. Consultations to Paris firefighters about the fire. Personally visited Hungarian churches. Conduct an experiment with a flame retardant. Conducted research in fire legal regulations, in the case which fire protection options are available in Hungarian church buildings [8-10].

Deployed equipment from the Paris firefighters and the results

Drone: excellent for high reconnaissance (the fire also spread to the bell tower)

Firefighting robot: they could be sent into the building to put out a fire without endangering the life of a firefighter.

Installable water cannon: firefighters can be deployed elsewhere

Fire boat: provision of extinguishing water to the responders

Their widespread distribution in Europe, but especially in Hungary.

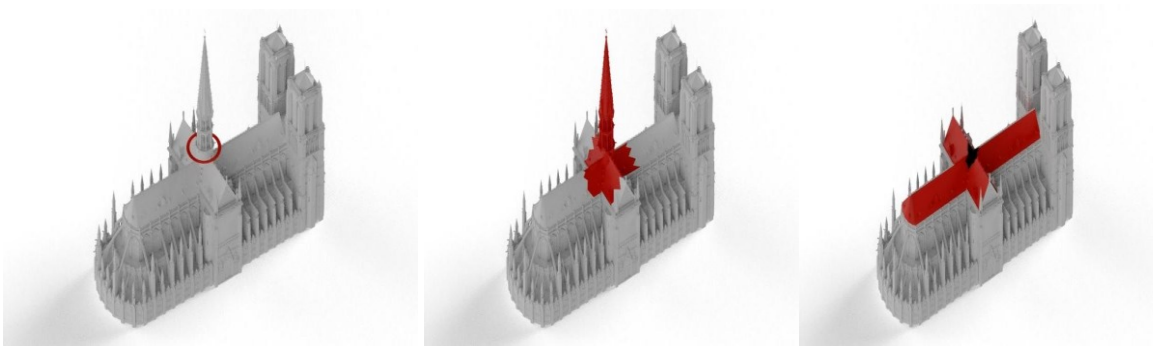


Figure 1 – Spread of the fire.

1. The fire started around the hussar tower and then started to spread.
2. It spread along the nave and the transept.
3. The fire spread along the entire length of the nave and transept.

Results

Request for static expert is very important. In case of a fire in a church, the protection of the bell towers is very important, if the bell breaks the building may collapse. Wood treated with a fire retardant can help firefighters. Using a drone can be crucial, noticing small details. Firefighters could benefit from using firefighting robots. Organizing exercises in church buildings can be useful

References

[1] 5 lessons from fact-checking the Notre Dame fire: https://www.poynter.org/fact-checking/2019/5-lessons-from-fact-checking-the-notre-dame-fire/ Download: 01.05.2023.

[2] Restás Ágoston; Pántya Péter; Rácz Sándor; Érces Gergő; Hesz József; Bodnár László: A komplexitás értelmezése a Tűzvédelmi és Mentésirányítási Tanszék oktatási és kutatási tevékenységében, In: Vass Gyula; Restás Ágoston; Bodnár László: Tűzoltó Szakmai Nap 2018 ” Tudományos Konferencia" : A XXI. századi biztonsági kihívások hatásai a magyar katasztrófavédelemre, Budapest, Hungary: BM OKF (2018) 233 p. pp. 228-232.

[3] National Geographic – Notre Dame – Versenyfutás a lángokkal. https://heavy.com/news/2019/04/notre-dame-great-bell-emmanuel Download: 01.05.2023.

[4] Varga Ferenc: Structural and operational model for volunteer fire brigades. *Hadmérnök*, 13. 2. (2018), pp. 345-359.

[5] Bérczi László - Varga Ferenc: Nemzetközi tűzvizsgálati gyakorlat elemzése. *Védelem Tudomány*, 1. 3. (2016), pp. 28-45.

[6] Fentor László - Varga Ferenc: Magyarországi tűzvizsgálati rendszer és fejlesztési lehetőségeinek értékelése. *Műszaki Katonai Közlöny*, 26. 3. (2016), pp. 66-73.

[7] Rácz Sándor: A tűzvizsgálati eljárás eredményessége a veszélyes helyszíni eljárási cselekményeket végzők felkészültségének szempontjából. *Hadmérnök*, 13. KÖFOP különszám (2018), pp. 145-159.

[8] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. *Polgári Védelmi Szemle,* 14. DAREnet projekt Különszám. (2022), pp. 116-131.

[9] Huszka Zsolt - Rácz Sándor - Bodnár László: Hazards and occupational safety of firefighting interventions. *American Journal of Research Education and Development,* 2021. 2. pp. 27-37.

[10] Lucza Edit - Kerekes Zsuzsanna - Szép János - Restás Ágoston: Reuse of Polyethylene Waste as Building Material in view of Fire Protection. In: Bodnár, László; Heizler, György (szerk.) Proceedings of the Fire Engineering & Disaster Management Prerecorded International Scientific Conference. Budapest, Hungary : Nemzeti Közszolgálati Egyetem (2021) 503 p. pp. 62-70.

Levente Zoltán Lőrincz

Household fires and their prevention

Introduction

I've always admired firefighters and their work, for me they are the everyday heroes, who despite the many trials and tribulations always do their job with passion and courage and more importantly save lives every day. My goal in life is something similar, and that is to have a profession that is worth getting up for every day and that I am proud to be a part of. During my university studies, I wanted to gain an early insight into the services of the intervention teams and the work they do, and I wanted to be part of it. During my first semester at university, I applied to a local volunteer fire brigade. My service there strengthened my sense of calling. The professional staff there immediately took me under their wing and tried to pass on the knowledge and experience they had gained during their years of service. It was then that I became more interested in this subject, in relation to accidents in the home and house fires. Unfortunately, there was an accident of this kind almost every second day, a very high percentage of which could have been prevented. It is terrible to see a life's work reduced to ashes in the blink of an eye. In the posters below, I wanted to show, through pictures and a short summary text, the causes of these disasters and what could be done to prevent them, because anyone can take some measures, which would prevent a potential disaster. Last year, there were nearly 6000 house fires in Hungary. As a result of these fires 443 people were injured, most of them suffering from smoke inhalation. Firefighters rescued 310 people from burning buildings. On average, it took 40 minutes to contain the flames. Thirty-eight percent of the house fires were extinguished within ten minutes. A total of 3,737 hours were needed to extinguish house fires in the first 9 months of the year, with 11,183 fire engines responding to the burning buildings. A total of 84,000 square meters of land was burnt in houses. There were 704 fires in chimneys, but it was common for fires to starts in kitchens, bedrooms, storage rooms or living rooms. Most dwelling fires were caused by smoking, cooking, in combination with the failure of electrical devices or heaters. Most fires occur in the weekends and nighttime. Research has found that the most common victims of fatal home fires are men, the elderly and young children. many victims had low levels of attention, but also included those who were under the influence of alcohol or otherwise less or not at all sane. In most cases fires in the home start in the living room or bedroom of the property, near furniture, textiles, clothes or various technical equipment. [3] By the end of September, firefighters had been alerted to 849 carbon monoxide-related incidents, 124 people had suffered carbon monoxide poisoning and 9 people had died from the toxic gas. [1]

Kitchen Fires

When making the posters, I took into consideration the most common causes of house fires, such as cooking accidents in the kitchen, accidents caused by the failure and overloading of electrical networks, and finally fires caused by heating appliances, which are also very common. For each of these, I have looked for data and tried to describe the most common harmful outcomes that can happen to anyone in their own home. I have also tried to give an example of each of the

above-mentioned sources of disasters that could have been prevented, or, if they have already occurred, to give some indication of what the appropriate action might be to take in such cases. The first point on the poster is about kitchen fires. In most countries around the world, cooking is the main fire risk activity. improper use, inadequate maintenance and lack of supervision of cooking equipment play a major role in the development of such fires. especially in countries with a long tradition of cooking in oil or fat, pan fires occur in significant numbers. Other risk factors include aluminum cookware which can melt under high heat. [Miller, 2005]. [3] The emergency services often try to draw attention to this case, either by means of various demonstrations or by means of appeals, and not without reason, as this is a very common case of disaster in the home. Usually, such calls explain exactly what happens when oil overheats and ignites. In addition, the events that demonstrate this are used to show in a spectacular way why one should be wary of trying to extinguish a fire with water, as the resulting hot steam will spread like a huge plume of flame. In such cases, it is important to use the right extinguishing technique, which can be a dedicated extinguisher, which can come in handy if something unexpected happens to start a fire in your home, but the perfect solution is to put a lid on the burning oil as soon as it catches fire, thus depriving the fire of oxygen, one of the vital combustion conditions.

Electronical Fires

The second very common case shown on the poster is the failure of the electrical network in homes, overloading and fires caused by these causes.
Statistics on household fires show that the use of electrical appliances and electricity is also a major cause of fires, however, the proportion of fatal fires caused by electrical appliances is lower. [3] Inadequately used and poorly maintained wiring can quickly start to heat up, which at some point can ignite the insulation of the wiring and flammable building materials in the walls, not to mention the fact that sparks from electrical faults can also very quickly lead to trouble. These can be prevented by not only putting the appliances in standby mode after use, but also by disconnecting them from the mains and unplugging them in case of prolonged absence.
It is a good idea to have the home's electrical network checked by a competent professional from time to time. To prevent electrical fires, periodic electrical safety inspections of high-voltage equipment are carried out, also known as fire safety inspections. It is important to avoid improper wiring, splices and other improper connections, and the interconnection of extension cords. Unused and overheated electrical equipment (apart from heaters, ovens, irons) should be switched off after use. Avoid combustible materials around toasters, coffee machines and hotplates in the kitchen and place heat-resistant underlay underneath. You should also read the instructions for your electrical appliances for fire safety reasons. In the event of a fire, you should be careful how you extinguish it. Electrical fires should not be extinguished with water, but fire extinguishers are available which can be used to extinguish electrical fires. [2]

Fires Caused by Heaters

The third and final element in the poster is the failure of the various heaters and heating elements and the fires caused by the heat they emit. In most cases, the misplacement of these bodies can also lead to a disaster. Technical inspections and checks are an important condition for the safe operation of a heating system,

as they allow timely detection of any maintenance or repair work that may be necessary. As I mentioned for electrical installations, it is best to always have this work done by a professional.
It is important that electric heaters or gas-fired heaters are positioned in the living area so that no combustible material can reach them, and in rooms with combustible floors or floor coverings so that they are positioned in front of the door of solid fuel fired heaters, the door of a solid fuel burning appliance, a metallic ember trap shall be provided to ensure that any sparks or sparks that fall or fly out of the appliance cannot reach the combustible floor and do not constitute an ignition hazard to combustible material placed in the vicinity of the combustion appliance.In addition, combustible material must be placed at a sufficient distance from the heaters. The envelope of a gas heater in use may reach temperatures high enough to ignite clothing laid on it, so do not dry clothes on the heater. [2]

Conclusion

Nowadays, there are a lot of house fires every day, and in such cases, people's behavior and conduct are not always appropriate in the event of a fire. Surveys and investigation results show that approximately half of the fires investigated were caused by human error or improper behavior. It is also observed that the time interval between unsafe actions and the start of a fire is relatively short. [4] This underlines the fact that a large proportion of these incidents could have been prevented with a little care and preparation. The key to fire detection is rapid situational awareness. A fire spreads rapidly in seconds, so if you see a chance to contain and extinguish the fire, start it immediately, if not, the first thing to do is to notify the fire brigade and other occupants of the dwelling. The fire service can be contacted via the central emergency number 112. When calling for help, it is important to tell them the exact address of the fire, what is burning, what damage is there, what is at risk, the possibility of personal injury or the number of injured people and your own identification details.

References

[1] Lánglovagok:https://www.langlovagok.hu/12042/lakastuzek-merlege-2022-elso-harom-negyedeveben/ Download: 02.05.2023.

[2] Országos Tűzmegelőzési Bizottság: https://www.katasztrofavedelem.hu/application/uploads/documents/2019-09/64068.pdf Download: 02.05.2023.

[3] M. Kobes, K. Groenewegen, T. Morsche & Dr. M. G. Duyvis (2009): Consumer fire safety: European statistics and potential fire safety measures. Federal Ministry of Labour, Social Affairs, and Consumer Protection, pp. 1-57.

[4] L. Xiong, D. Bruck & M. Ball (2016): Preventing accidental residential fires: the role of human involvement in non-injury house fires. *Fire and Materials*, Vol. 41, No. 1 pp. 3-16.

Raphela Tlou

Fire safety management in the artificial intelligence era in developing countries

Introduction

Fire safety management is a crucial aspect of building management, and it has become even more important with the advent of new technologies such as artificial intelligence (AI). The risk of fire is not limited to developed countries alone, and developing countries are just as susceptible to fire outbreaks, if not more (Smith and Glauber, 2012). With the rapid advancement of technology, especially in the field of AI, fire safety management in developing countries needs to evolve to keep pace with these advancements (Goralski and Tan, 2020).

AI has brought significant changes to the world of fire safety management(Feizizadeh et al., 2022). AI-powered systems can detect and respond to fires in real-time, making them more effective than traditional fire safety systems (Panda et al., 2019). However, these advancements are mostly available in developed countries, and developing countries are left behind in terms of fire safety management (Kodur et al., 2020). Developing countries face several challenges when it comes to fire safety management, such as inadequate resources, lack of awareness, and inadequate enforcement of fire safety regulations (Alhajeri, 2011). These challenges can lead to devastating consequences in the event of a fire outbreak.

To address the challenges of fire safety management in the AI era in developing countries, it is essential to identify the factors that contribute to fire outbreaks. For instance, faulty electrical wiring, uncontrolled gas leaks, and inadequate fire prevention measures can all contribute to fire outbreaks (Oloke et al., 2022). Developing countries must also invest in fire safety education to increase awareness among the public (Zhang et al., 2019).

Furthermore, the use of AI technology can help to improve fire safety management in developing countries. For example, AI-powered fire alarms can detect fires in real-time and alert the authorities (Dattamajumdar, 2021). AI can also be used to simulate fire scenarios to test fire safety systems and identify potential weaknesses (Kinateder et al., 2021).

increase in the use of artificial intelligence (AI) technologies. AI has the potential to revolutionise many fields, including fire safety management. However, this potential has not been fully realized in developing countries, where fire safety management is often inadequate. This paper aims to explore the role of AI in fire safety management in developing countries and to provide recommendations for the effective use of AI in this field.
Fire safety management in the AI era in developing countries is a critical issue that needs to be addressed urgently. Developing countries must invest in fire safety education and AI-powered fire safety systems to prevent devastating consequences in the event of a fire outbreak. With the right measures in place, developing countries can improve their fire safety management and reduce the risk of fire outbreaks.

This paper will discuss the importance of fire safety management in the AI era in developing countries and propose ways to improve fire safety management in these countries.

Background

Fires can have devastating effects on human life, property, and the environment. Developing countries, in particular, are more vulnerable to fires due to factors such as poor infrastructure, inadequate fire safety regulations, and limited resources for fire safety management. These challenges have led to an increase in the number of fire incidents in developing countries, which highlights the need for effective fire safety management.
AI has the potential to enhance fire safety management in many ways. For example, AI can help in fire prevention, early detection, and response. AI technologies can also improve the efficiency and effectiveness of fire safety management by automating tasks such as fire risk assessments and evacuation planning.

Objective

The objective of this study is to explore the potential of AI in fire safety management in developing countries and to provide recommendations for the effective use of AI in this field.

Methodology

This study employs a literature review approach to explore the role of AI in fire safety management in developing countries. The literature review is conducted using a systematic search of electronic databases, including Google Scholar, ScienceDirect, and IEEE Xplore. The search terms used include "fire safety management," "artificial intelligence," "developing countries," and "fire risk assessment." The search was limited to articles published in English from 2010 to 2021.

Results

The literature review reveals that AI has the potential to enhance fire safety management in developing countries in many ways. AI technologies can help in fire prevention by identifying potential fire hazards and suggesting measures to reduce the risk of fire. AI can also assist in early fire detection by analysing data from sensors, cameras, and other sources to identify signs of fire. Furthermore, AI can improve response times by automatically alerting emergency services and providing real-time information on the location and severity of the fire.
However, the effective use of AI in fire safety management in developing countries faces several challenges. One of the main challenges is the lack of data and expertise in AI technologies. Developing countries often lack the necessary data on fire incidents and the resources to collect and analyse such data. Moreover, there is a shortage of experts in AI technologies, which makes it difficult to develop and implement AI-based fire safety management systems.

Discussion

The literature review highlights the potential of AI in fire safety management in developing countries. However, the effective use of AI in this field requires overcoming several challenges. One of the key challenges is the lack of data and expertise in AI technologies. To overcome this challenge, developing countries need to invest in data collection and analysis systems and provide training and education on AI technologies.

Another challenge is the high cost of AI technologies, which may be a barrier to their adoption in developing countries. To address this challenge, developing countries can explore alternative funding models, such as public-private partnerships or international aid programs.

Furthermore, the effective use of AI in fire safety management requires collaboration between different stakeholders, including government agencies, fire departments, and technology companies. Developing countries need to establish partnerships and collaborations to develop and implement AI-based fire safety management systems.

Recommendations

Based on the literature review, the following recommendations are provided for the effective use of AI in fire safety management in developing countries:

1) Invest in data collection and analysis systems: Developing countries need to invest in data collection and analysis systems to provide the necessary data for AI-based fire safety management systems.
2) Provide training and education on AI technologies:

References

[1] Alhajeri, M. (2011). *Health and Safety in the Construction Industry: Challenges and Solutions in the UAE* (Doctoral dissertation, Coventry University).

[2] Dattamajumdar, A. (2021). An early warning AI-powered portable system to reduce workload and inspect environmental damage after natural disasters. *arXiv preprint arXiv:2104.00876*.

[3] Feizizadeh, B., Omarzadeh, D., Mohammadnejad, V., Khallaghi, H., Sharifi, A., & Karkarg, B. G. (2022). An integrated approach of artificial intelligence and geoinformation techniques applied to forest fire risk modeling in Gachsaran, Iran. *Journal of Environmental Planning and Management*, 1-23.

[4] Goralski, M. A., & Tan, T. K. (2020). Artificial intelligence and sustainable development. *The International Journal of Management Education*, *18*(1), 100330.

[5] Kinateder, M., Ronchi, E., Nilsson, D., Kobes, M., Müller, M., Pauli, P., & Mühlberger, A. (2014, September). Virtual reality for fire evacuation research. In *2014 federated conference on computer science and information systems* (pp. 313-321). IEEE.

[6] Kodur, V., Kumar, P., & Rafi, M. M. (2020). Fire hazard in buildings: review, assessment and strategies for improving fire safety. *PSU research review*, *4*(1), 1-23.

[7] Oloke, O. C., Oluwatobi, A. O., & Amusan, L. M. (2022). Adequacy of Fire Safety Measures of Residential Buildings in Peri-Urban Neighbourhoods of Ibadan, Oyo State, Nigeria. *International Journal of Real Estate Studies*, *16*(1), 14-23.
[8] Panda, Geetanjali, Ashwani Kumar Upadhyay, and Komal Khandelwal. "Artificial intelligence: A strategic disruption in public relations." *Journal of Creative Communications* 14, no. 3 (2019): 196-213.
[9] Smith, V. H., & Glauber, J. W. (2012). Agricultural insurance in developed countries: where have we been and where are we going?. *Applied Economic Perspectives and Policy*, *34*(3), 363-390.
[10] Zhang, Y., Shen, L., Ren, Y., Wang, J., Liu, Z. and Yan, H., 2019. How fire safety management attended during the urbanization process in China?. *Journal of Cleaner Production*, *236*, p.117686.

Benjamin Hózer– Lajos Kátai-Urbán–Réka Magdolna Rácz Kirovné–Ferenc Varga

Fire hazard risks at municipial landfill sites

Abstract

Fire hazards are a primer safety factors in municipal solid waste landfills (MSWLF) all over the world. Despite this, there is no specific legal regulation for this exact sector in Hungary.[1] Althought MSWLF's has hazards, that only appears at landfills. In my presentation, I'm going to summarize these hazards, based on my experiences and international viewpoints.
Keywords: waste management, resource management, extinguishing water management, fire safety, industrial safety

Introduction

More than 70 municipal solid waste landfills are in operation in Hungary.[2] Most of them doesn't have special fire fighting equipment nor staff. Smaller fire cases are regular at landfills, but huge fires are not that common. As there are no specific legal regulation for landfill fire safety, there are huge differences and gaps between each landfills. Some have bigger care and others not. Also each operating companies have different methods for fire prevention. Some prefers dry extinguishing methods like dirt and sand. While others prefer wet methods like water and foam.

Objective

Our main task is to detect the primary hazards and plan legal methods to avoid incidents. Fire incidents are very common at landfills. Nonetheless of this, no exact legislation has been written for fire safety at MSWLFs in Hungary.[3] By detecting the primary hazards and creating manner for fire preventionm it is important to create a legal solution for these tasks.

Createing manner for staff to successfully participate in fire prevention, fire detection and extinguishing. Today, there is no prescription for fire detection at landfill sites.[4] Yet, CCTV cameras with thermal imaging, could be a good equipment for this task. Sirens can also be attached for sound alarm to the alarm center. This allows the system not to be overwatched for 24 hours, but can left working alone. Also usefull for night guards. Each operating companies have different methods for fire prevention. Some prefers dry extinguishing methods like dirt and sand. While others prefer wet methods like water and foam. A unified method needs to

[1] Antal, Imre – Rudolf Nagy: A települési hulladékkezelés tűzbiztonságának munkavédelmi szempontú vizsgálata. Védelem Tudomány, 6, no. 4 (2021). 42–72.
[2] Kátai-Urbán, Lajos – Gyula Vass – Alexandra Német: Veszélyes tevékenységek biztonsága a fenntarthatóság jegyében. Védelem Tudomány, 5, no. 1 (2020). 137–152.
[3] Kiss Leizer, Géza Károly: Környezetbiztonság a hulladékok hasznosításában. Hadmérnök,10, no. 3 (2015). 109–118
[4] Pál, Angéla: A kommunális hulladékok környezeti hatásai, a hulladékgazdálkodás, mint ellenhatás. Hadmérnök, 11, no. 2 (2016). 87–98.

be created for fire extinguishing for the landfill's staff.[5] There's also a huge need for the local fire brigades to ensure they local knowledge of the working place. Terrain can differ very quickly. Routes can appear and disappear, as new piles of trash cames in to the landfill. The most usual firefigthing technic is making the surface soaking wet, so the fire spread stops at the surface. Yet, fire can spread subsurface also. This is called subsurface oxidation (SSO). There's also a need for more effective new firefighting methods against on surface oxidation.[6] Water mist lances could be an effective and watersaving methods for putting out hot spots. Subsurface oxidation can also be tracked with thermal image cameras. Hotter landfill gas erruption can be a sign for fire spreading at SSO events.[7]

Also to reduce the number of potentially high fire hazard materials in the site area. High potential fire hazardous materials are mainly bales from the landfills sites recycler plant units. Number and placing of these bales are not restricted anyhow. While it is clear that it is a must to separate row of the bales from each other with some kind of barriers.[8] Work out method for subsurface fire detection and tracking. Develop health protection for firefighters working on landfill fire scenes.

It is also a huge problem to maintain the healthy circumstance for the involved firefighters on scene. It is necessary to take measurment for what gases those the burning waste can produce. And also to have a respirator that have a longer operational time and lighter weight than the SCBA's. Gas masks are a good alternatives for this.

Methods

Analysis and evaluation of international and domestic legal regulations on fire safety and related scientific literature. Field test of different methods, involving mobile laboratory. Team test for different methods and apparatus during firefighting.

Results

Thermal cameras can be an optimal and cheap way for both detecting and tracking fires. New methods on landfill firefighting and SSO tracktion are in experimental stage. Also new equipment for firefighting and self protection are also in experimental stage.

---

[5] Rácz, Réka Magdolna – Balázs Lóderer: A klímaváltozás és annak következménye-ire való felkészülés lehetséges jövőbeni aspektusai. Hadtudományi Szemle, 4, no. 3 (2011). 91– 98.

[6] László, Bodnár; Péter, Pántya: The Threat of Forest and Vegetation Fires and the Possibilities of Intervention in Hungary, Academic And Applied Research In Military And Public Management Science 18: 3 pp. 21-31. , 11 p. (2019)

[7] Restás, Ágoston ; Mwangi, Peter Wanderi ; Kováts, Antónia ; Vass, Gyula ; Jane, Wanjiku Kamau ; Bilha, Wanjiku Muchiri ; Jane, Nyutu; Bodnár, László: Examination of the characteristics of combustible biomass and its effect on forest fires, Polgári Védelmi Szemle 14 : DAREnet projekt Különszám 2022 pp. 261-269. Paper: 9 , 9 p. (2022)

[8] Érces, Gergő; Vass, Gyula; Ambrusz, József: Épületek károsító hatásokkal szembeni rezilienciájának jellemzői, Polgári Védelmi Szemle 15 : DAREnet projekt Különszám pp. 117-130. , 14 p. (2023)

Conclusions/suggestions

Fire safety needs to be more regulated at landfill sites. More water should be stored at landfill sites for fire extinguishing. Employees needs to be train for firewatch and firefighting on basic level. High potential fire hazardous materials needs to be removed and devided with concrete walls.

References

[1] Antal, Imre – Rudolf Nagy: A települési hulladékkezelés tűzbiztonságának munkavédelmi szempontú vizsgálata. *Védelem Tudomány*, 6, no. 4 (2021). 42–72.

[2] Kátai-Urbán, Lajos – Gyula Vass – Alexandra Német: Veszélyes tevékenységek biztonsága a fenntarthatóság jegyében. *Védelem Tudomány*, 5, no. 1 (2020). 137–152.

[3] Kiss Leizer, Géza Károly: Környezetbiztonság a hulladékok hasznosításában. *Hadmérnök*,10, no. 3 (2015). 109–118.

[4] Pál, Angéla: A kommunális hulladékok környezeti hatásai, a hulladékgazdálkodás, mint ellenhatás. *Hadmérnök*, 11, no. 2 (2016). 87–98.

[5] Rácz, Réka Magdolna – Balázs Lóderer: A klímaváltozás és annak következményeire való felkészülés lehetséges jövőbeni aspektusai. *Hadtudományi Szemle*, 4, no. 3 (2011). 91– 98.

[6] László, Bodnár; Péter, Pántya: The Threat of Forest and Vegetation Fires and the Possibilities of Intervention in Hungary, *Academic And Applied Research In Military And Public Management Science* 18: 3 pp. 21-31. , 11 p. (2019)

[7] Restás, Ágoston ; Mwangi, Peter Wanderi ; Kováts, Antónia ; Vass, Gyula ; Jane, Wanjiku Kamau ; Bilha, Wanjiku Muchiri ; Jane, Nyutu; Bodnár, László: Examination of the characteristics of combustible biomass and its effect on forest fires, *Polgári Védelmi Szemle*, 14 : DAREnet projekt Különszám 2022 pp. 261-269. Paper: 9 , 9 p. (2022)

[8] Érces, Gergő; Vass, Gyula; Ambrusz, József: Épületek károsító hatásokkal szembeni rezilienciájának jellemzői, *Polgári Védelmi Szemle* 15 : DAREnet projekt Különszám pp. 117-130. , 14 p. (2023)

Section C – Firefighting and rescue operation management

Eszter Bognár – Péter Pántya

Volunteer Firefighting Associations abroad and in Hungary

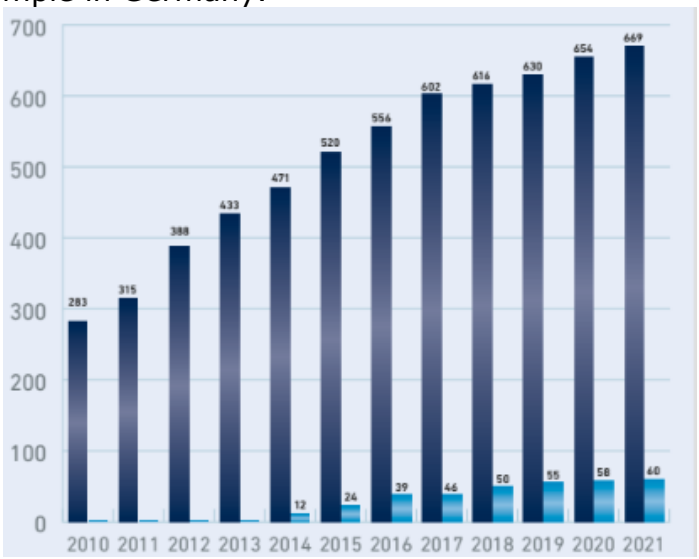
Abstract

The goal is to explore Hungarian volunteer firefighting organizations in detail and analyze the current problems and difficulties in an analytical way, as well as looking for solutions to these challenges available options taken into account.
Voluntary firefighting organizations are of outstanding importance in the Hungarian context in the field of fire protection, so the focus of our research is on their management.

Keywords: volunteer firefighting, national examples, international examples

Introduction

The figure shows the increase in the number of Hungarian volunteer fire departments from year to year. Although this number is increasing, it is still much less than, for example in Germany.



Source: BM OKF: Almanac of Disaster Management: 2021
ÖTE (light blue): volunteer firefighter associations intervening independently in Hungary
EMÜ (in dark blue): volunteer firefighter association with cooperation agreement with professional firefighters

Methods

This research includes:

- Presenting the current independent volunteer firefighter's
- Foreign outlook (Germany, Austria)
- Questionnaire about the subject of volunteering, after the age of 18

Questionnaire

One of the authors (Eszter Bognár) prepared a questionnaire about domestic volunteering, in which they were asked questions regarding why individuals who are old enough, do not perform voluntary work. The question was directed at the above-mentioned aspect, which there was an individual response option to. The parameters of the questionnaire: It was completed by 19 people, 9 women and 10 men between the ages of 18 and 30.

Questionnaire results

7 people were not aware of the fact that in our country you can apply for ÖTE membership. A further 6 people did not apply due to lack of time. 3 people considered themselves unfit to provide services. The remaining 3 questioned people did not undertake service for other reasons. People who are also inrolled in the same institute, have told that the lack of firefighter truck drivers is a major disadvantage in terms of volunteering. Analysis and figure by Eszter Bognár.

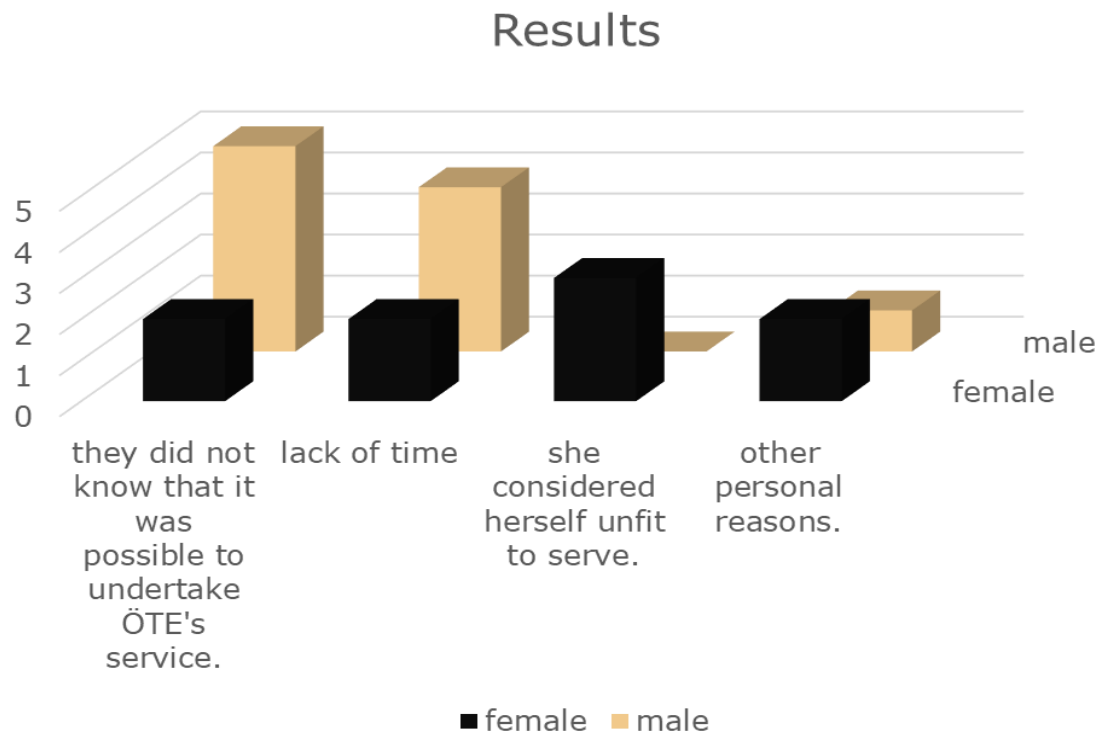


Figure 1 - Results of the questionnaire. Created by the Authors.

Conclusions

All in all, the right of existence of volunteer fire brigades in Hungary can absolutely be verified. It is cost-effective as well as the efficiency of the rescue and fire protection are increased by them, and it also increases the coverage of fire departments within the country. The foreign examples mentioned in the thesis confirm this fact, although in a completely differently built fire protection structure, but it is undeniable that they work more efficiently. According to this proposal, it is worth promoting volunteering in the domestic context, perhaps build a reward system in this regard, as well as drawing attention to the possibility of this amongst young people.

References

[1] Varga Ferenc: A mentő tűzvédelem fejlesztése – önkéntes tűzoltókkal I. *Védelem Katasztrófavédelmi Szemle,* 26. 5. (2019), pp. 48-52.

[2] Leidinger Kitti: Az önkéntes tűzoltóságok helye és szerepe a közigazgatásban a mentő tűzvédelem perspektívájából – szakdolgozat, 2016, Pázmány Péter Katolikus Egyetem Jog- és Államtudományi Kar Közigazgatási Jogi Tanszék (Leidinger Kitti: The place and role of volunteer fire brigades in public administration from the perspective of emergency fire protection)

[3] Varga Ferenc: A mentő tűzvédelem fejlesztése – önkéntes tűzoltókkal II. *Védelem Katasztrófavédelmi Szemle,* 2019 : 6 pp. 5-9. , 5 p. (2021).

[4] Dobson Tibor tű. dandártábornok: A beavatkozások fejlesztése, prezentáció, Magyar Tűzoltó Szövetség, (Tibor Dobson Brigadier General: The development of interventions, presentation Hungarian Fire Association), Link: https://docplayer.hu/47147721-Magyar-tuzolto-szovetseg-dobson-tibor-ddtbk-elnok.html

[5] Bayerisches Feuerwehrgesetz

[6] XXXI. of 1996. Act on Fire Protection, Technical Rescue and Fire Service

[7] XXXIII. of 2008 Act on voluntary firefighting associations

[8] Bodnár László: Logistic challenges of firefighting in case of moving to the fire site. *American Journal of Research Education and Development*, 2022. 1. pp. 27-35.

[9] CXXVIII. of 2011 act on disaster prevention and the amendment of certain related laws

[10] Restás Ágoston; Pántya Péter; Rácz Sándor; Érces Gergő; Hesz József; Bodnár László: A megelőző és mentő tűzvédelem valamint az iparbiztonság kapcsolódásai (The links between preventive and rescue fire protection and industrial safety), In: Vass, Gyula; Mógor, Judit; Kovács, Gábor - Dobor, József; Horváth, Hermina: Katasztrófavédelem 2018: Veszélyes tevékenységek biztonsága, Budapest, Hungary BM OKF (2018) 347 p. pp. 340-340.

[11] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. Polgári Védelmi Szemle, 14. DAREnet projekt Különszám (2022), pp. 116-131.

Anett Dobó

Cooling interventions for firefighters: to increase efficiency and concentration

Abstract

The occupation of firefighting involves physically demanding tasks such as climbing ladders and stairs, rescuing victims, and transporting equipment, which can result in high levels of physical stress. These demands are due to both intrinsic metabolic and physical demands of the tasks themselves, as well as external stressors such as protective clothing and equipment. While firefighting uniforms provide thermal protection, they can also limit the body's ability to dissipate heat, leading to discomfort. To address this, cooling vests have been developed to reduce skin temperature and humidity, increasing comfort. The author's objective is to investigate the impact of cooling vests on firefighters' ability to concentrate.
Keywords: firefighter, personal protective equipment, heat stress, cooling clothes,

Introduction

Firefighters are one of the most essential professions in our society, as they put their lives on the line to protect us and our property from fire-related incidents. Therefore, it is crucial for firefighters to have the right equipment and knowledge about fire safety measures to ensure their safety while firefighting. Personal protective equipment (PPE) is a crucial element for firefighters to keep them safe from the heat, flames, smoke, and other hazards while in action. During the firefighting and technical rescue activities, it is not possible to fully ensure a nonhazardous and safe working environment with collective protection, as they may be exposed to numerous mechanical, biological and chemical effects. The use of personal protective equipment during interventions may provide an adequate level of protection. PPE is designed to offer firefighters protection from the direct contact of flames and heat, and acts as a barrier to prevent injuries, burns, and other hazards. The most common PPE used by firefighters includes fire-resistant suits, helmets, gloves, and boots. These garments help reduce the amount of heat that is transferred to the body while retaining body temperature while operating in cold environments. [1] Aside from the PPE, firefighters also need to understand how they can prevent heat stress and related hazards during operations. Firefighting is a physically demanding job. Heat stress is a dangerous condition that occurs when the body is unable to cool itself effectively. [2] This can result in a variety of symptoms, including cramps, dizziness, headaches, and even heat stroke. For firefighters, the risks of heat stress are particularly significant, as they are often exposed to extremely high temperatures and must wear heavy protective gear that can insulate their body and prevent heat from escaping.[3] The combination of high temperatures and heavy protective gear can lead to a range of problems for firefighters, including dehydration, elevated body temperatures, and fatigue. This can result in decreased performance levels, slower reaction times, and even errors in judgment, all of which can.[4][5] In recent years, cooling clothing has become an essential safety measure for firefighters, providing them with the necessary protection to perform their duties efficiently and effectively.

Cooling clothing for firefighters has come a long way, from simple garments to high-tech gear that can regulate a firefighter's body temperature and protect them

from the heat.[6] The primary purpose of cooling clothing is to keep firefighters safe and comfortable during active duty. It works by absorbing sweat from the body, dissipating heat and allowing the skin to breathe. The clothing is waterproof, fire-resistant and lightweight, providing maximum protection with minimum inconvenience.[7][8] One of the essential features of cooling clothing is its ability to keep firefighters cool in hot environments. This is achieved by using special cooling technology.

Method

The basic idea of my research is the examination of the currently known environment of interventions, the examination of the personal protective equipment in use from several aspects. Based on the obtained results, my research objective is primarily to research a personal protective equipment that can be used to avoid the long-term damage to the human body caused by a long-term interventional firefighting career, thus increasing the level of protection and ergonomic compliance. For the purpose of all this, I study the relevant literature, the research results published in domestic and international scientific publications. In addition, I use primary research methods (questionnaire survey) to learn about the users' own experiences and opinions on the ergonomic characteristics of the personal protective equipment, which is the driving force behind the research. My goal is to test the effects of the cooling clothing worn while performing firefighter tasks on the human body and attention. I use the Pieron test, which is suitable for measuring the ability to concentrate. Attention tests and assessments are designed to measure an individual's ability to sustain and control their focus and concentration in a variety of environments and situations. One such test that is commonly used is the Pieron-Test. Developed by Jules Pierce in 1907, the Pieron-Test is still used today to assess a person's ability to maintain and direct their attention over an extended period. The Pieron-Test involves presenting the participant with a series of letters, numbers, and symbols in random order, which they must mark in a specific pattern, such as only marking vowels or even numbers. The test requires the individual to rapidly switch and filter their attentional focus to not only identify the specific target but also suppress irrelevant distractions. The time taken to complete the test and the number of errors made are recorded to create a score of attention capacity and control. The participants also responded to a questionnaire regarding their thermal perception.

Results

The short-term goal/result of the research is for the author to get an idea of the development of the ability of firefighters to concentrate as a result of wearing personal protective equipment. Each firefighting intervention is risky. That is why our firefighters have to pay great attention to both their active and passive defense. This study attempted to improve firefighter uniforms by developing and evaluating a comfortable and thermally balanced design. With the use of the cooling clothes presented by the author, we can increase the effectiveness of the interventions and the protection of our staff.

Conclusion

In the course of my research work, using international literature, technical descriptions, standards, the topics and experiences of lectures given at international conferences and the empirical studies I have conducted. I will produce research results that can be used to improve the safety of life and avoid accidents of intervening firefighters, as well as to reduce the number of accidents at work and minimize damage to health.

References

[1] Restás Ágoston: Tűzoltó védőruházat ergonomikus vizsgálata és fejlesztésének lehetséges irányai a beavatkozók komfortérzetének javítása érdekében az éghajlatváltozás hatásainak enyhítésére. In: Földi László - Hegedűs, Hajnalka (szerk.): Adaptációs lehetőségek az éghajlatváltozás következményeihez a közszolgálat területén. Nemzeti Közszolgálati Egyetem, Budapest, 2019. 320-350.o

[2] Restás Ágoston 2016. Pszichológia a tűz frontvonalában. Védelem Tudomány, 1.3.(2016), 46-56.

[3] Kanyó, Ferenc Tűzoltók teljesítőképességének határai pp. 1-16. Paper: 5 In: Budapesti, Tűzoltó Szövetség (szerk.) Légzésvédelem és az égési sérülések ellátása Budapest, Magyarország (2010)

[4] Kovács, Norbert ; Pántya, Péter THE LIFE-SAVING ACTIVITY OF FIREFIGHTERS, IT'S MEANS AND CIRCUMSTANCES In: László, Bodnár; György, Heizler (szerk.) 2nd Fire Engineering & Disaster Management Prerecorded International Scientific Conference Védelem online – cooperated with the University of Public Service : Book of extended abstracts Budapest, Magyarország : Védelem online (2022) 201 p. pp. 105-107.

[5] Huszka, Zsolt ; Rácz, Sándor ; Bodnár, László Hazards and occupational safety of firefighting interventions AMERICAN JOURNAL OF RESEARCH EDUCATION AND DEVELOPMENT 2021 : 2 pp. 27-37. , 11 p. (2022)

[6] Gilda Santos, Rita Marques, João Ribeiro, Adriana Moreira Firefighting: Challenges of Smart PPE August 2022Forests 13:1319 DOI:10.3390/f13081319 https://www.researchgate.net/publication/362775912_Firefighting_Challenges_of_Smart_PPE

[7] Kóródi Gyula (2013): Health screening examinations in cardiovascular risk estimation. AARMS, Vol. 12, No. 1. 39–44.

[8] Cian és mtsai, Influence of variations in body hydration on cognitive function: Effect of hyperhydration, heat stress, and exercise-induced dehydration https://www.researchgate.net/publication/232561018_Influence_of_variations_in_body_hydration_on_cognitive_function_Effect_of_hyperhydration_heat_stress_and_exercise-induced_dehydration

[9] Christopher J Stevens , Lee Taylor , Ben J Dascombe Cooling During Exercise: An Overlooked Strategy for Enhancing Endurance Performance in the Heat Sports Med 2017 May;47(5):829-841. doi: 10.1007/s40279-016-0625-7. https://pubmed.ncbi.nlm.nih.gov/27670904/

László Farkas - Sándor Rácz

Examining the physical abilities of firefighters

Abstract

The conditioning requirements of today's firefighting jobs, in my opinion, require firefighters to take care to maintain or improve their physical abilities. This is helped by the mandatory sports activity on service days. But it is believed that the differences in different facilities and equipment do not make it possible to carry out a modern, centrally controlled common training plan. In my research, I assessed, analyzed and compared the current physical condition of several colleagues at my dutystation in my service group. I supplemented the comparative test with my own questionnaire survey, which provided insight into the attitude of the staff to sports.
Keywords: Physical condition, training, anaerobic threshold, lacticacid, motivation

Introduction

My choice of topic is based on the fact that for 13 years I have been active within the ranks of disaster management as a firefighter. I finished my schooling at the University of Physical Education as a physical education teacher and as an athletic coach. My connection to sports is very strong. During my daily work, I quickly got to know the daily workload of the staff and the working conditions. I realized that the strong physical load which comes with the every day work demands excellent conditional skills from the staff who intervene in the actions. It can be concluded that the firefighters are exposed to less than ideal conditions in a dangerous environment during the interventions. Besides, it can be stated that the average age of the intervention staff is unfortunately increasing rapidly, there are more and more old firefighters. The statutory annual physical assessment needed to be renewed. With this new test, the physical condition of firefighters can be examined more efficiently and accurately. However, in addition to the annual survey, it is also worth examining and monitoring the preparedness of the staff at the local level during the year. So the topic is so actual to know that in what other ways we can examine this at the local level.

Objectives

My goal is to assess, analyze and compare the current physical condition of several colleagues in my service group at my place of duty. I will perform the survey with an anaerobic threshold test in several steps on a treadmill. After analyzing the obtained results, i will make conclusions about the physical state of the surveyed people and present them in writing. I will complete the test with a questionnaire survey of my own, which will give insight into the attitude of the staff towards sports. I am trying to involve the majority of the staff in this survey.

Method

The treadmill survey I conducted is a simplified version of the laboratory spiroergometric test, where we can test the person's physical ability under the same conditions (in case of cyclical movement). The advantage of this is that we

can gradually increase and control the load, and the data obtained by the survey can be used and compared without limits. Surveys can be repeated and the status of the surveyed people can be monitored. The goals of load tests can be different. I performed the tests in the conditioning room at our firestation. The load determining the anaerobic threshold was performed on an Insportline T6000i treadmill. The incline of the ergometer (treadmill) during the survey was 2% (this incline was needed to counteract the physical fact that the belt moves backwards). Resting heartrate was measured before the test. After a warm-up walk, the test started with an 8 km/h run. The duration of a loading phase was 2 minutes, with half a minute of rest. We increased the speed of the next load stage by 2 km/h. During the half-minute rest period, capillary blood was taken from fingertip with a Lactate Scout device, so I could check the lactic acid results. During the test, heart rhythm was continuously measured with a Garmin Forerunner 735XT device. I examined 10 people divided into two groups of five based on their pre-training (trained and untrained group). As a supplement to the research, I used a self-edited questionnaire survey, which contained 18 questions. I tried to evaluate the received answers using basic mathematical methods (average calculation, percentage calculation), based on a simple comparison.

Findings/ Results

It can be concluded that the measured results of the resting heartrate before exercise do not show a large difference. Values were between 50-90 beats/minute corresponding to the values in the literature. In the results obtained at the first load stage (8 km/h), we have not yet experienced any significant differences. The lactic acid values of each person were between 2.8-3.4 mmol/l, which corresponds to the values generated during aerobic work. Also, the heartrate values were between 110-131 beats/minute, which indicates a low load. At the second stage (10 km/h), the lactic acid result of one of the examined colleagues (from group II) already reached a value of around 5 mmol/l, which indicates that the accumulation of lacticacid in the body had already started, and he could not maintain an aerobic level with the given work. At the third step (12 km/h), all non-athletic colleagues have already reached the workpoint where the aerobic process has already turned into anaerobic. At the same time, colleagues practicing sports (group I) were in a workphase that could be carried out for an even longer period of time. At the fourth step (14km/h), all colleagues, except for one (non-athletes) had already reached their maximum workphase (their lactic acid level rise to 8-9mmol/l). Their heartrate has risen above 180 beats/minute, it is difficult to maintain work here, the energy is only sufficient for a few minutes (they can’t maintain work for a longer period of time). Colleagues who exercise regularly reached the anaerobic threshold at the fifth step and were able to run into the sixth step as well, where they achieved the maximum acidification.

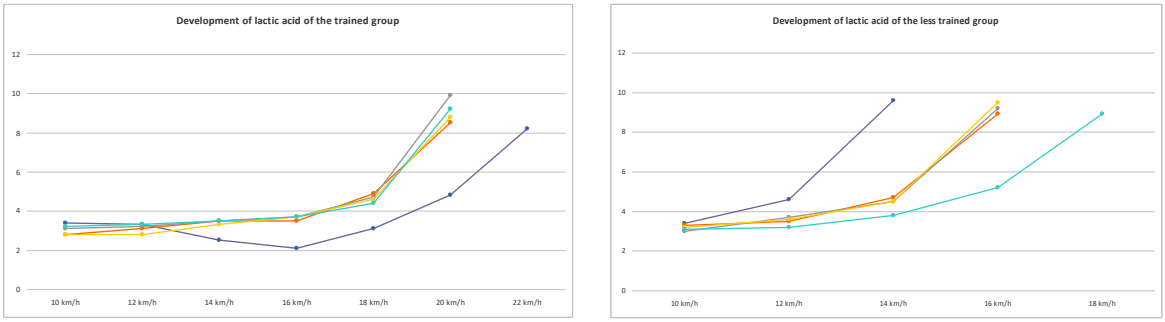


Figure 1 - The lactic acid curve of the two groups

So it can be stated that in the group of people who are in better physical condition, the velocity corresponding to the anaerobic threshold was higher, and their heartrate values started to increase later. Which means that they will probably endure the load longer, so they will get tired later in damage event, which requires serios work. This statement is also confirmed by the comparison of the heartrate curves of the two groups.

Name	1. stage		2. stage		3. stage		4. stage		5. stage		6. stage	
	HR	Lactic	HR	Lactic	HR	Lactic	HR	Lactic	HR	Lactic	HR	Lactic
F.L.	115	3,4	124	3,3	133	2,5	141	2,1	150	3,1	168	4,8
B.Á.	125	2,8	142	3,1	155	3,5	165	3,5	174	4,9	182	8,5
G.S.	129	3,4	142	4,6	157	9,6						
T.A.	126	3,1	141	3,2	156	3,5	164	3,7	171	4,7	177	9,9
Cs.T.	130	3,3	145	3,5	162	4,7	182	8,9				
B.G.	131	3,0	147	3,7	160	4,5	184	9,2				
Sz.D.	122	2,8	137	2,8	135	3,3	145	3,7	165	4,6	185	8,8
P.L.	130	3,2	146	3,6	163	4,5	186	9,5				
M.Cs.	123	3,1	139	3,2	159	3,8	168	5,2	185	8,9		
D.B.	120	3,2	130	3,3	149	3,5	166	3,7	171	4,4	187	9,2

Figure 2 - Summary Table.

When evaluating the questionnaire survey, the results showed significant differences in some points with regard to the interviewed colleagues. There are those who are satisfied with their physical condition, but there are the others who know that they should improve. It can be said that the motivation of those who should improve is different, but the colleagues who excersise regularly have a significant influence on them. They are not necessarily satisfied with their sport trainer's professionalism (this is definitely an area to be improved). It can also be stated that unfortunately, in case of those who also work in a second job (presumably they have a second job), that affects significantly their physical activity in the service. Many people come to the service tired and unmotivated, they have no desire or motivation to train even in the service.

Conclusions/ recommendations

To summarize, it can be concluded that as long as the interventional and damage liquidation work of the rescue fire protection means serious physical workload for the intervener firefighters, we must also pay special attention to the health, mental and physical condition of our colleagues. When writing my essay, I wanted to present and assess the physical condition of the members of my service group. There is almost no need to justify the actuality of the research topic. Unfortunately, the workforce is getting older and older, there are few new installers, and more and more dismantling colleagues (as a result significant shortages occur). The colleagues who stay here are under increasing pressure in all areas. Of course, the physical load is also increasing. We can reduce this pressure with regular physical activity. It has been proven that sport not only has a health-preserving role, but also has a stimulating effection in the body and in mind. It results in positive changes in the body, which can be felt as soon as we start the sport activity. So we have to improve the physical condition of our colleagues, we have to monitor this process and it is recommended to check it regularly at the local level.

References

[1] Kanyó Ferenc: A tűzoltók fizikai alkalmasságának felmérése az új évezredben Doktori (PhD) Értekezés

[2] Molnár Sándor Az aerob és anaerob képességek meghat. laboratóriumban és pályán. Atlétika Bp. 1979

[3] Nádori László Az edzés elmélete és módszertana Budapest, 1991

[4] Frenkl Róbert: Sportélettan, 1983. évi második, átdolgozott, bővített kiadás változatlan utánnyomása,Plantin-Print Bt, Budapest, 1995

[5] Apor Péter Sportolók vérsavasodásának vizsgálata. TF tudományos k özleményei

[6] Bodnár László: Examination of the carried overload for firefighters with a physical load test. *Védelem Tudomány*, 6. 3. (2021), pp. 513-530.

[7] Pántya Péter: Extra load and limitations on firefighters pp. 485-485.

[8] Varga Ferenc: Structural and operational model for volunteer fire brigades. *Hadmérnök*, 13. 2. (2018), pp. 345-359.

[9] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. Polgári Védelmi Szemle, 14. DAREnet projekt Különszám (2022), pp. 116-131.

Attila Fülöp – Péter Pántya

Special use of firefighting vehicles in disaster prevention: Safe use of firefighting cranes, possibilities to promote safety

Abstract

In this presentation we would like to present the safe operation of fire cranes, which is essential during technical rescue processes. We hope that the facts and explanations described can help the effectiveness of the interventions to avoid possible crane accidents. It is considered important because there are numerous sources of accidents when rescuing with a fire crane, which can lead to the collapse of the fire crane, overturning, which can cause serious, life-threatening injuries to the operating and rescue personnel and other rescue personnel, can lead to technical damage to the crane. However, with proper knowledge, these hazardous situations can be avoided. Must be mentioned as an important fact that we may have less time to organize the rescue process than with industrial cranes. Due to this reduced time interval, the chances of accidents can increase.
Keywords: firefighting vehicles, safe use, technical condition.

Introduction

Nowadays, accidents happen every single day, the vast majority of which occur during road traffic. Due to the rapid development of society, road transport and transportation are taking on huge proportions, as a result of which a lot of goods flow on motorways and main roads. With regard to shipping, we know that most of these goods are transported in large, robust trucks with a total weight of up to 40 tons by default.

The technical rescues of these lorries must be carried out with special devices, technical rescue cranes or only with their use.

Such and similar factors necessitate the use of fire truck cranes in fire interventions, disaster management.

Methods

Application of research methods: Quantitative and Qualitative.

Results

Technical conditions for lifts

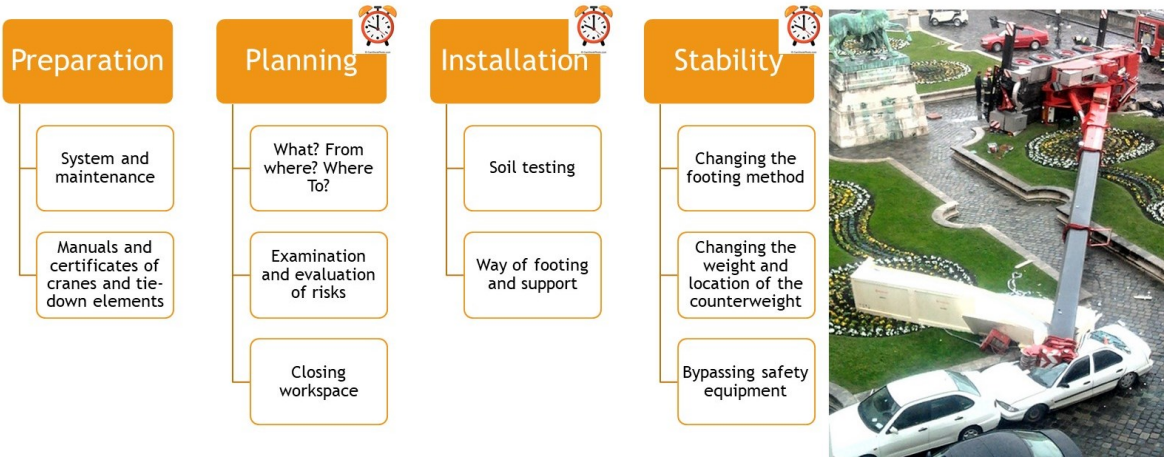


Figure 1. - Technical conditions for lifts. Created by the Authors.

Conclusions

Instead of centralized exam centers, the creation of centralized training centers, which are non-profit based. Introduction of interactive, skill-developing course material during theoretical training.

Introduction of simulation exercises under controlled conditions during practical sessions, increasing technical knowledge. Completion of career aptitude tests, introduction of advanced level examinations.

Provision of individual training in case of deficiencies.

References

[1] Restás Ágoston, Pántya Péter, Rácz Sándor, Érces Gergő, Hesz József, Bodnár László: A komplexitás értelmezése a Tűzvédelmi és Mentésirányítási Tanszék oktatási és kutatási tevékenységében, In: Vass Gyula; Restás Ágoston; Bodnár László: Tűzoltó Szakmai Nap 2018 ” Tudományos Konferencia" : A XXI. századi biztonsági kihívások hatásai a magyar katasztrófavédelemre, Budapest, Hungary: BM OKF (2018) 233 p. pp. 228-232.

[2] Pántya Péter: „A tűzoltói beavatkozás veszélyes üzem?” Bolyai Szemle (2014/3).

[3] Pántya Péter: „Eredmények a tűzoltói készségek növelésében.” Bolyai Szemle (2015/4).

[4] Hajdú, Gábor: „A kvantitatív és a kvalitatív társadalomtudományi kutatás módszerei.” MTA TK Szociológiai Intézet (2018/2).

[5] Kása László, Dr. Meleghegyi Tibor, Pécsi Ottó: Emelőgépek biztonságos üzemeltetése. Budapest: Multikran Kft., Pécsi Ottó .

[6] Varga Ferenc: Structural and operational model for volunteer fire brigades. Hadmérnök, 13. 2. (2018), pp. 345-359.

[7] Farkas Ádám. gepnet.hu. 2011-06-30. 06 30. <http://gepnet.hu/hirek/Szakcikkek/auto_es_mobildaruk_i_-400.html>.

[8] Horváth Hermina: „A MÁV ZRT. Műszaki mentési és segélynyújtási utasítása...” Hadmérnök (2016).

[9] Elek Barbara - Hák Viktor - Kovács Gábor: Ipari hulladéktározók kockázatának vizsgálata. Hulladék Online, 3. 2. (2012), Paper: Elek, Hák, Kovács , 12 p.

[10] Lévai Zsolt: Közlekedésbiztonság. Budapest: Dialóg Kampusz Kiadó, 2019.

Mélykúti Sándor: „Baleset után, javítás előtt – okok és teendők.” Vedelem.hu (2015).

[11] Boncz, Imre: KUTATÁSMÓDSZETANI ALAPISMERETEK. Pécs: Pécsi Tudományegyetem Egészségtudományi Kar, 2015.

[12] Rolf, Krüger. Soldat und Technik. 2005. 08. <https://epa.oszk.hu/02700/02735/00058/pdf/EPA02735_katonai_logisztika_2006_2_246-259.pdf>.

[13] Szabó Sándor Tibor: „A közérdekű feladatot ellátó szervezetek állományának komplex felkészítése a biztonságos közlekedésre.” NKE Hadtudományi Doktori Iskola. Budapest: NKE, 2014.

[14] Véghelyi György – Mutnyánszki Tíbor: „Baleseti tanulságok, tanulságos balesetek 2006-ban.” vedelem.hu (2006).

Tamás Igaz-Danszky – Judit Bolgár –József Hesz

The psychological aspects of the work of the Capital Disaster Management's Operation Control Service

Abstract

The Disaster Management's Operation Control Service is an important station for the reports received from citizens. The staff working here often make vital decisions within a very tight timeframe. There are many psychological aspects to this often challenging work that are related to the conditions in which they work, the schedule they keep, and the nature of their work itself. The presentation aims to illustrate the psychological effects on the staff working here and the potential serious consequences. It presents a few possible solutions as well.
Keywords: Operation Control Service, psychological aspect, psychological risk, Disaster Management.

Introduction

It is well known that the work of firefighters is unique, and due to its uniqueness, it often involves a stressful work environment. The staff regularly participate in psychological screenings. The Operation Control staff also participate in these screenings. The question arises what are the psychological effects affect them, and what can we do to decrease them?

Objective

The aim of the research was to explore the psychological effects on the staff working in the Operations Control Service. What effects result from the timeline and working conditions and what are the effects generated by the nature of the work itself? And an additional aim was to develop possible recommendations to mitigate these psychological risks.

Method

I chose the Capital Operations Control Service as the location for the research, as both the conditions and the work there have the most possible negative characteristics. I chose the method of induction technique for the research, considering that I identified the possible risks based on experience. Furthermore, I studied relevant literature on this topic.

Findings/results

The listed items are risk factors, which do not necessarily apply to everyone, but rather indicate that the following situations and activities carry the listed risks.

The main risk factors for operational control work are:

- High levels of stress related to the job, including psychological, traumatic, social, and personal stress, which can often cause anxiety and depression, as well as post-traumatic stress disorder.

- The constant pressure to make decisions under time constraints can cause mental and emotional strain, and downtime between events can lead to decreased vigilance. The consequence can be both physical and emotional exhaustion.
- The 12/24, 12/48 work schedule can disrupt the biological clock, disturb the sleep cycle, and lead to sleep and personal problems. Sleep deprivation and exhaustion can also decrease attention and concentration, which can lead to a decrease in work quality and an increase in errors.
- Sitting for long periods of time can cause back and neck pain, muscle weakness, headaches, and eye fatigue, which can reduce work efficiency and quality of life.
- The conditions related to placement can increase feelings of isolation and professional isolation.

The listed problems can have a harmful effect on an individual's long-term mental and physical health and can even lead to more severe psychological problems and personal conflicts.

Conclusion/suggestion

Managing the psychological risks listed above is necessary as it is a fundamental factor for successful long-term work. The following possible solutions are recommended for addressing these risks:

Technological solutions: The operators in Operation Control work with a large amount of information at once. Computer decision support, using digital tools or utilizing virtual tools can be useful solutions that facilitate work. Of course, these solutions are available, but further work-improving developments are possible.

Communication and coordination: Adequate communication and coordination are particularly important from the perspective of Operation Control. Proper communication with the Emergency Response Team - both from the leadership and the directed side - provides significant advantages, and proper coordination, including support for the explanation of leadership decisions that affect the unit, makes it easier to solve stressful situations.

Change in workplace location: The main advantage is that improving the work environment can improve the mood, health, and performance of employees. Relocation can improve professional and professional-personal relationships between colleagues. In addition, in the case of original location, the daily relationship between the Operation Control and the management could improve by moving to a joint building with the Directorate.

Mental health protection: Employers should recommend solutions that protect the mental health of their employees, such as mental health support, psychological counseling, or therapy, if necessary. This option is also available, as the Capital Disaster Management Directorate has a Psychological Service.

Training and support: Newly recruited employees need to be taught the appropriate communication techniques and proper stress management techniques. Proper training and support can help employees manage pressure effectively and reduce risks. In addition, it is important that the work environment in Operation

Control is suitable for concentration and decision-making, and that dispatchers have the opportunity to take breaks and rest during work.

References

[1] Hódos Tibor: A képernyős feladat okozta pszichológiai megterhelés (I. rész), Hippocrates II/5, 2000. szeptember-október, p. 319-325.

[2] Hódos Tibor: A képernyős feladat okozta pszichológiai megterhelés (II. rész), Hippocrates II/6, 2000. november-december, p. 381-386.

[3] Bolgár Judit- Csomós István: A rendőrségi bevetési feladatatok követelményeihez kapcsolódó kiválasztási eljárások fejlesztése, különös tekintettel az extrém stresszreakciókra, Hadtudományi Szemle V.:(3-4) pp. 268-278. (2012)

[4] Hesz József, Igaz-Danszky Tamás: A szélsőséges időjárási körülményekből eredő tömeges jelzések kezelése a fő- és műveletirányító ügyeletenm, *Polgári Védelmi Szemle* 14 : DAREnet projekt Különszám 2022 pp. 132-142. , 11 p. (2022)

Jane Kamau – Lukas Waiganjo – Elvus Okoth – Gitahi Theuri – Bilha Muchiri – Ágoston Restás – Johanna Farkas

Cardiorespiratory fitness and body composition of first responders in Murang'a County, Kenya

Abstract

Cardiorespiratory fitness and body composition are not only key components of physical fitness vital in the health and wellbeing of an individual but are also critical in work performance of first responders. This study assessed both cardiorespiratory fitness and body composition of first responders in Murang'a County, Kenya. Cardiorespiratory fitness was assessed using predicted VO_{2Max} from the multistage shuttle run test, Body composition was assessed using Body Mass Index and Waist to Hip Ratio. Results indicated that the mean VO_{2Max} of the first responders was $\bar{x}$=34.29ml/kg/min^{-1}, lower than the recommended level of 42ml/kg/min^{-1} for firefighters. The mean BMI was $\bar{x}$=25.88kg/m^2, which was in the overweight category. The mean Waist to Hip ratio was.85 which was in the low-risk category for cardiovascular disease. Pearson correlation identified a significant negative correlation between VO_{2Max} and BMI (r (35) = -.40, p=.02). There was no significant correlation between VO_{2Max} and WHR and age, however, there was significant positive correlation between WHR and age (r (35) =-.43, p=.01). The study results pointed towards the need to develop and implement a fitness training and conditioning program that will help improve the cardiorespiratory and body composition of the first responders to the internationally recommended standards. Additionally, since the results of this study cannot be generalized to all the first responders in Kenya, a similar nationwide study is necessary to allow comparisons of data between gender and among different age categories.
Keywords: Cardiorespiratory fitness, body composition, first responders.

Introduction

Cardiorespiratory fitness (CRF) is vital in ensuring the supply of oxygen and nutrients to the mitochondria of skeletal muscle for energy production during physical activity (Raghuveer et al., 2020). It is well established that poor CRF is a strong independent predictor of cardiovascular disease (CVD) and all-cause mortality in adults while good CRF is positively associated with cardiovascular health, enabling participation in high intensity activities over an extended period of time without undue fatigue (Raghuveer, et al., 2020).

For first responders, particularly fire fighters, good CRF is crucial for their safety, and lowers their risk of developing CVD. This is because firefighters are exposed to extreme metabolic and cardiorespiratory stressors in the performance of their jobs that are recognized to exceed the actual physical or environmental hazards (Strauss, et al., 2021). They have to work under physically strenuous situations while wearing heavy personal protective equipment and self-contained breathing apparatus in an attempt to limit exposure to extreme heat, low oxygen and toxic environmental conditions, thus raising the risk of thermal injuries and hypoxia induced altered cardiac rhythms. These factors further strain the cardiovascular system (Lockie, etal.,2022 as well as increase firefighters metabolic stress as results of the increased aerobic and anaerobic energy costs, decreased mobility,

increased perception of effort and difficulty of the fire ground tasks (Strauss, etal.,2021).

The recommended cardiorespiratory standard for firefighters is 12 METs or a VO_{2Max} of 42ml/kg/min^{-1} (McKinney, etal.2021). Levels below this may limit ability to perform full-duty tasks such as operating hose lines, carrying equipment, making forcible entries, climbing ladder raises, crawling, searching, dragging victims or casualties and may result in cardiovascular events or deaths. According to Ras et al. (2023), approximately 45% of on-duty related mortalities of firefighters in the US are due to sudden cardiac death with many of the fatalities related to cardiovascular disease and overexertion while performing emergency duties.

Obesity has been correlated with decreased cardiorespiratory function (Nogueira etal, 2016). Individuals with higher body mass indexes (BMIs) and lower levels of physical fitness are more likely to experience injury while on duty and perform poorer on work related physical tasks in comparison with fitter counterparts whereby, for every one unit increase in BMI, risk of job disability increases by 5%. Additionally, fire fighters with a BMI of ≥30.2kg.m^2 have significantly increased risk of work related injury when compared to firefighters with BMI <27.2kg.m^2, Chizewski, Box, Keisler & Petruzzello, (2021),

The aim of this study was to assess CRF and body composition (BC) of first responders in Murang'a County, Kenya, Fire and Disaster Management Services (FRMC) Department. In view of paucity of data regarding the physical fitness levels of first responders in Kenya, this assessment will be the basis for designing and implementing a physical fitness and conditioning programme for the FRMC and possibly scaled up to all 47 Fire and Disaster Management Service units in Kenya, should the intervention program yield positive outcomes.

Objectives

The study on the FRMC was guided by the following objectives:

1. To determine their body composition
2. To determine their cardiorespiratory fitness
3. To analyze the association between body composition and cardiorespiratory fitness of the first responders

Methodology

The study used a cross-sectional analytical study design to assess BC and CRF of 37 male and female first responders with the following procedures used:

Body composition

Body composition was determined using Body mass Index. Weight was measured using the Seca Robusta 813 digital scale. Height was measured using the Seca 213 Stadiometer. BMI was calculated using the following formula: BMI= weight (kg) / [height (m)]^2

Waist and hip circumferences were measured using a Cescorf anthropometric tape measure. Waist to hip ratio was computed in order to help determine the CVD risk of the first responders.

CRF was determined using the 20m multistage shuttle run beep test. The beep audio recording was played to cue the respondents to run from one cone station to another over a distance of 20 metres. The respondent level and number of shuttles were noted and later used to calculate the predicted $V0_2max$ in ml/kg/min^{-1}.

Data Analysis

Data were cleaned and coded in SPSS 20 for analysis. Descriptive statistics of percentages, means and standard deviations were used to summarize the raw data. Pearson product moment correlation was used to test the associations between cardiorespiratory fitness and body composition. The level of significance was set at 0.05.

Results and Discussions

Distribution of Participants by Gender

83.80% of the FRMC were male, while 16.20% were females.

BMI

The results indicated that 5.4% of the first responders were underweight, 45.9% had normal weight, 37.8% were overweight while 10.9% were obese**.** The underweight first responders were males while majority of the obese first responders were females.

Waist to Hip Ratio

Majority of the first responders (89.2%) were in the low-risk category for cardiovascular disease, while 5.4% were in the moderate risk and another 5.4% in the high-risk category.

Predicted VO_{2Max}

The results indicated that none of the first responders had a VO_{2Max} in the excellent and above average category: 2.7% were in good, 10.8% average, 21.6% below average, 37.8% poor and 27% very poor categories suggesting that cardiorespiratory fitness measured through predicted VO_{2Max} was generally lower than the recommended level of 42ml/kg/min^{-1} for firefighters. The only first responder with a VO_{2Max} in the good category was a male, while all the female first responders had their VO_{2Max} in the poor or very poor categories.

Pearson Correlation Table for BMI, WHR and VO_{2Max},

There was a significant negative correlation r (35) = -.40, p=.02 between BMI and $VO_{2Max.}$ suggesting that as BMI increased, there was a significant decrease in the $VO_{2Max.}$ of these first responders. The results also showed a positive correlation between WHR and age r (35) =-.43,p=.01, whereby as the age increased, the WHR measurement also increased.

Discussions

There were fewer female first responders than males, an observation similar to that of Hollerbach et al., (2019) and Sinden, et al, (2013) who observed that first

response and firefighting in particular is a male dominated career with substantial underrepresentation of women in the service.

The reason for this is possibly the physically demanding nature of the job and the inherent risk for injuries and fatalities. The first responders had a mean BMI score of 25.88kg/m^2 indicating they were moderately overweight. Although overweight and obesity increase the risk for CVD in the general population, the implications in firefighters is greater. The mean BMI in the male first responders despite being categorized as overweight, was lower than that of the females. Mean BMI in females however was higher and comparable to what is considered as a precursor for work related injury when BMI is ≥30.2kg.$m^{2.}$ Chizewski, Box, Keisler & Petruzzello, (2021). There was a significant association between BMI and VO_{2Max} as an increase in BMI was matched by a decrease in VO_{2Max}. It is worth noting that only one responder attained the recommended VO_{2Max}. for a first responder while all the others recorded values below those of career firefighters in a study by Vicete, Herrero and Prieto (2021) who recorded a mean VO_{2Max} of 45.7Ml/kg/min^{-1}, in which 60% of the firefighters had levels above the minimum standard work effectively. Although there was no significant association between Waist to Hip Ratio and BMI or VO_{2Max}, in this cohort, WHR was shown to increase with age. However, some major limitations of this study were: it focused on one County, had a sample size of 37 first responders, and only had 6 females, thus limiting generalizability of the results to other first responders in the other 46 Counties in Kenya.

Conclusions

Given the low mean $VO2_{Max}$ of the first responders in Murang'a County, an indication of poor cardiorespiratory fitness, coupled with high mean BMI scores especially among the females, there is need to develop and implement a fitness training and conditioning program that will help improve the CRF and BC of the first responders. Secondly, a nationwide study on firefighters to assess their CRF and BC is necessary, as the findings of this study cannot be generalized to all first responders in Kenya, to allow for comparisons of data between gender and among different age categories.

References

[1] Hollerbach BS, Heinrich KM, Poston WSC, Haddock CK, Kehler AK, Jahnke SA. Current Female Firefighters' Perceptions, Attitudes, and Experiences with Injury. Int Fire Serv J Leadersh Manag. 2017;11:41-47. PMID: 31225527; PMCID: PMC6586224.Lockie, R.G.; Dulla, J.M.; Higuera, D.; Ross, K.A.; Orr, R.M.; Dawes, J.J.; Ruvalcaba, T.J. Body Composition and Fitness Characteristics of Firefighters Participating in a Health and Wellness Program: Relationships and Descriptive Data. Int. J. Environ. Res. Public Health 2022, 19, 15758. https:// doi.org/10.3390/ijerph192315758

[2] McKinney ZJ, Bovard RS, Starchook-Moore MN, Ronneberg K, Xi M, Bredeson DM, Schwartz EC, Thelen SL, Nash TL, Dickinson M, McDonough T, Hirdman K, Pronk NP. Cardiorespiratory Fitness of Firefighters: Initial Results of a Multi-Phased Study. J Occup Environ Med. 2021 Jan 1;63(1):57-63. doi: 10.1097/JOM.0000000000002067. PMID: 33105400; PMCID: PMC7773167.

[3] Nogueira EC, Porto LG, Nogueira RM, Martins WR, Fonseca RM, Lunardi CC, de Oliveira RJ. Body Composition is Strongly Associated With Cardiorespiratory Fitness in a Large Brazilian Military Firefighter Cohort: The Brazilian Firefighters Study. J Strength Cond Res. 2016 Jan;30(1):33-8. doi: 10.1519/JSC.0000000000001039. PMID: 26691405.

[4] Raghuveer G, Hartz J, Lubans DR, Takken T, Wiltz JL, Mietus-Snyder M, Perak AM, Baker-Smith C, Pietris N, Edwards NM; American Heart Association Young Hearts Athero, Hypertension and Obesity in the Young Committee of the Council on Lifelong Congenital Heart Disease and Heart Health in the Young. Cardiorespiratory Fitness in Youth: An Important Marker of Health: A Scientific Statement From the American Heart Association. Circulation. 2020 Aug 18;142(7):e101-e118. doi: 10.1161/CIR.0000000000000866. Epub 2020 Jul 20. PMID: 32686505; PMCID: PMC7524041.

[5] Ras J, Kengne AP, Smith DL, Soteriades ES, Leach L. Association between Cardiovascular Disease Risk Factors and Cardiorespiratory Fitness in Firefighters: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2023 Feb 5;20(4):2816. doi: 10.3390/ijerph20042816. PMID: 36833514; PMCID: PMC9957465.

[6] Sinden K, MacDermid J, Buckman S, Davis B, Matthews T, Viola C. A qualitative study on the experiences of female firefighters. Work. 2013;45(1):97-105. doi: 10.3233/WOR-121549. PMID: 23241712

[7] Strauss M, Foshag P, Jehn U, Brzęk A, Littwitz H, Leischik R. Higher cardiorespiratory fitness is strongly associated with lower cardiovascular risk factors in firefighters: a cross-sectional study in a German fire brigade. Sci Rep. 2021 Jan 28;11(1):2445. doi: 10.1038/s41598-021-81921-1. PMID: 33510237; PMCID: PMC7843993.

[8] Vicente MM, Herrero DC, Prieto JP. Cardiorespiratory Fitness in Spanish Firefighters: Age Differences and Associations Between Fitness-Related Parameters. J Occup Environ Med. 2021 Jun 1;63(6):e318-e322. doi: 10.1097/JOM.0000000000002199. PMID: 33769332.

Yaroslav Kalchenko – Mykhailo Pikalov

Determination of the electrical conductors parameters in the emergency mode of operation

Abstract

Studies have been conducted to determine the parameters of electrical conductors with different cross-sections in the event of a short circuit. Graphs of the dependence of the electric current multiplicity on the time of the short circuit occurrence at which the insulation temperature of electrical cables with different cross-sections reaches the temperature of its ignition were constructed. From the analysis of these dependencies, it follows that, depending on the multiplicity of the electric current during a short circuit, electric cables with copper conductors heat up faster than electric cables with aluminum conductors of the same cross section, which is associated with higher permissible currents for conductors with copper conductors. It is determined that even at small multiples of the short-circuit current, the insulation of electrical wiring can ignite. The minimum values of the parameters of electrical conductors at which, in the event of a short circuit in an electrical network with a faulty protection device, their insulation may ignite, which will lead to a fire, are determined.
Keywords: temperature of electric cable, short circuit, multiplicity of electric current

Introduction

A properly designed and properly installed electrical network does not guarantee the exclusion of the possibility of emergencies leading to unacceptable overheating of electrical cables in the event of a short circuit.

The duration of a short circuit is usually tenths of a second and, as an exception, can reach several seconds. During this short period of time, the heat generated is so great that the temperature of the conductors exceeds the limits set for normal operation. The heating process stops when the damaged part of the system is automatically disconnected, after which a relatively slow cooling process takes place. Even a short-term increase in the temperature of conductors during a short circuit can lead to softening and melting of the metal, burning of insulation, destruction of contacts, and other damage. To ensure reliable operation of the electrical system, it is necessary to prevent such damage, which is achieved by selecting the appropriate size of conductive parts and, if possible, by quickly automatically shutting down damaged circuits. The property of a conductor to withstand the short-term thermal effects of a short-circuit current without damage is called thermal resistance. The criterion for thermal resistance is the end temperature, which is limited by the mechanical strength of the metals and the resistance to heat of the insulation.

The permissible end temperatures of conductors have been established on the basis of experience and are given in [1]. They are higher than the permissible temperatures during normal operation, since changes in the mechanical properties of metals and insulation wear are determined not only by temperature but also by the duration of heating, which is short under the conditions under consideration. The magnitude of the electric current during a short circuit can vary in a large range. In [1], the values of electric current are not given, when passing through an electric conductor, the ignition of its insulation can occur, which will cause a

fire. In [2], studies of molten parts of copper conductors formed as a result of sparking of the wiring during a short circuit are presented. The results of the research show that the analysis of these particles allows us to make assumptions about the characteristics of electrical conductors during a short circuit, the conditions and scenario of fire.
Paper [3] presents research on determining the temperature of sparks that can be formed in electrical conductors during a short circuit. In the study, the temperature of sparks was determined for different materials of conductor cores and their height. It was determined that an electric spark formed under the ceiling at a height of 10 m can cause the ignition of paper, rubber and plastic on the floor of this room. In [4], the results of experimental studies are presented, which show that electrical sparks generated by a short circuit in a 220 V electrical network can lead to the combustion of cotton, paper and polyurethane foam. At the same time, the studies do not consider the possibility of ignition of the insulation of electrical conductors as a result of a short circuit and the parameters under which this is possible. Thus, the unresolved part of the problem under consideration is the determination of the parameters of electrical conductors when they are heated due to a short circuit.

Objective

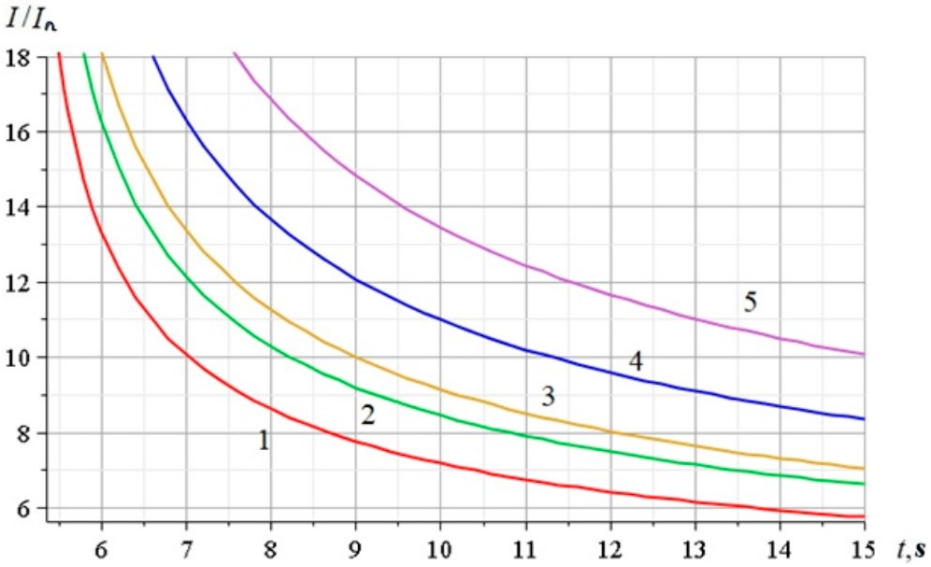
The aim of the work is to determine the time when the temperature of an electrical conductor reaches the ignition temperature of its insulation in the event of a short circuit in an electrical network with a faulty protection device.

Method

To achieve this goal, the methods of solving the equations of mathematical physics and the use of mathematical software in the Maple environment were used.

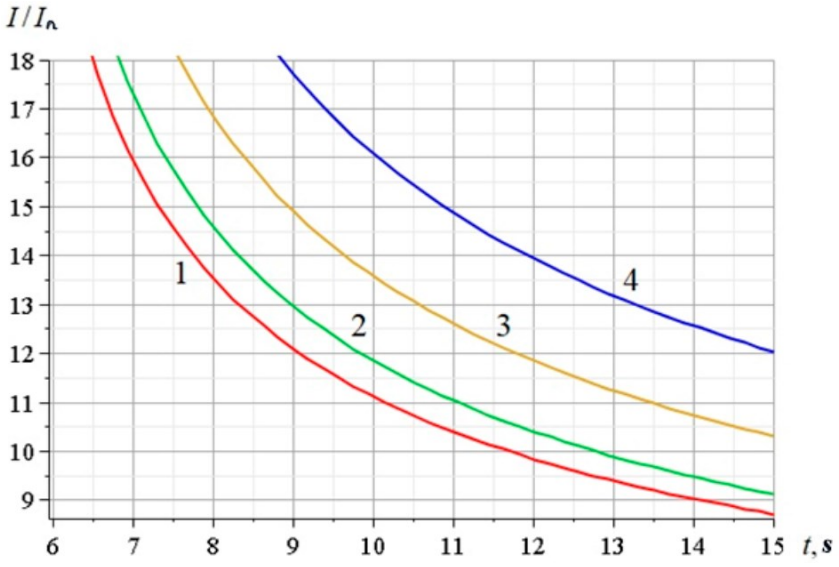
Findings/results

The calculation of the temperature of electrical conductors at a short circuit was carried out for "VVG" and "AVVG" electrical cables. The "VVG" electric cable consists of a copper conductor, polyvinyl chloride (hereinafter PVC) insulation and a PVC sheath, and the "AVVG" cable consists of an aluminum conductor, PVC insulation and a PVC sheath. The initial temperature of the cable before short circuit is 55 ℃. This temperature corresponds to the operating current carried by the cable before the occurrence of a short circuit of the order of the maximum permissible continuous current at an ambient temperature of 25-30 seconds.
The amount of electric current during a short circuit can vary in the range of (2,5 ÷ 18)In . The nominal values of the current were selected from Tables 1.3.5-1.3.6 [1]. The short-circuit time is equal to the time of operation of the protection device. The melting point of PVC insulation can vary from 150 to 250 °C, depending on the manufacturer and its manufacturing methods. In the calculations, we will assume the worst case, when the melting point of the insulation is 150 °C.
If the protective device is in a faulty state, the duration of a short circuit can be tens of seconds. The ignition temperature of PVC is 482 °C. The time for the temperature of the electric cable insulation to reach the temperature of the electric core depends on its time constant.



Picture 1 - Dependence of the electric current multiplicity of "VVG" conductors on time: 1 - conductor cross section 10 mm^2; 2 - conductor cross section 6 mm^2; 3 - conductor cross section 4 mm^2; 4 - conductor cross section 2.5 mm^2; 5 - conductor cross section 1.5 mm^2;

The value of the insulation heating time constant depends on the type of wiring, material, conductor cross-section and insulation and is determined by experiment. The temperature of the insulation can reach a temperature of 500°C if the short circuit duration is at least 5 seconds. With such a short circuit duration, the cable insulation has time to heat up to this temperature.



Picture 2 - Dependence of the electric current multiplicity of "AVVG" conductors on time: 1 - conductor cross section 10 mm^2; 2 - conductor cross section 6 mm^2; 3 - conductor cross section 4 mm^2; 4 - conductor cross section 2.5 mm^2;

The calculation of the parameters of an electrical conductor during a short circuit is based on the assumption that heat is retained inside the current-carrying element during the short circuit, i.e., adiabatic heating occurs. However, during a short circuit, heat is transferred to adjacent materials and must be taken into

account.
The temperature of the current-carrying cores of an electrical conductor during a short circuit can be determined from the expression

$$T = (T_b + \beta)\exp\left(\frac{I_a^2 t}{K^2 S^2}\right) - \beta, \quad (1)$$

where T_b - is the initial temperature of the current-carrying core of the electrical conductor, β - is the inverse of the temperature coefficient of resistance, t - is the duration of the short circuit, K - is a constant depending on the material of the current-carrying core, S - is the cross-sectional area of the current-carrying core, and I_a is the electric current during a short circuit calculated on the basis of the adiabatic heating process.
The multiplicity of the electric current flowing in the conductor during a short circuit is described by the expression:

$$N = \frac{\sqrt{t \ln\left(\frac{T+\beta}{T_b+\beta}\right)} SK\varepsilon}{tI}, \quad (2)$$

According to formula (2) the dependences of the short-circuit current multiplicity for "VVG" and "AVVG" electric cables with different cross-sections on the time at which the insulation temperature of these cables reaches 500 °C were constructed, which are presented in pic. 1 and pic. 2, respectively.

From the analysis of the dependencies presented in pic. 1 and pic. 2, the minimum time for the insulation temperature of an electric cable to reach its ignition temperature was determined, and the results are presented in table. 1.

Table 1 - Minimum time for electric cable insulation to reach the ignition temperature.

"AVVG"					
S, mm^2	2,5	4,0	6,0	10,0	
t,s	6,5	6,8	7,6	8,8	
"VVG"					
S, mm^2	1,5	2,5	4,0	6,0	10,0
t,s	5,5	5,8	6,0	6,6	7,6

It should be noted that the results presented in table 1 were calculated at a short-circuit current multiplicity of N=18.

Conclusion/suggestions

The current regulatory document does not provide a methodology for determining the temperature of electrical conductors, but only the nominal values of the electric current at which the temperature of the conductor is permissible, so it is impossible to determine the critical values of the electric current at which the temperature of

the insulation of electrical conductors will reach its ignition temperature, which can lead to a fire. According to the results of the study, it is possible to estimate the possibility of fire formation during emergency modes of operation of electrical networks for conductors of VVG grades with cross-sections from 1.5 to 10 mm^2 and "AVVG" with cross-sections from 2.5 to 10 mm^2.

As a result of the study, the parameters of electrical cables of the "VVG" and "AVVG" brands with different cross-sections were determined in the event of a short circuit in the electrical network.

From the analysis of the dependencies presented in pic. 1 and pic. 2, it is possible to determine the time of fire occurrence due to the ignition of electrical wiring during a short circuit. From the analysis of these dependencies, it follows that even at small multiples of the short-circuit current, the insulation of electrical wiring can ignite. From the results given in table. 1, it can be concluded that the larger the cross-section of the current-carrying core of an electric cable, the longer it will take to heat up, with the same values of the multiplicity of electric current in a short circuit. This is due to the fact that the permissible values of electric current for electric cables with copper conductors exceed the permissible current values for cables with aluminum conductors.

The values of the minimum time for reaching the temperature of electric cables of the "VVG" and "AVVG" brands with different cross-sections up to 500 °C, which is the minimum ignition temperature of PVC insulation, were determined and presented in the form of a table. The dependences of the electric current multiplicity of electric cables of "VVG" brands with cross-sections of 1.5, 2.5, 4.0, 6.0, and 10.0 mm^2 and "AVVG" brands with cross-sections of 2.5, 4.0, 6.0, and 10.0 mm^2 on time were constructed. It was determined that in the event of a short circuit in an electrical network with a faulty short-circuit protection device with an electric current multiplicity of I/In=18, the maximum time of ignition of the insulation of the studied electrical cables would be 8.8 seconds.

References

[1] Rules for the arrangement of electrical installations. [Effective as of 2017-21-08].Kyiv: Ministry of Energy and Coal Industry of Ukraine, 2017. 754p. URL:http://online.budstandart.com/ua/catalog/docpage.html?id_doc=72758.

[2] Ying Wu, Wei G., Man D., Chang Zh. (2010). Surface Analysis of Electrical Arc Residues in Fire Investigation. Applied Mechanics and Materials, 34, 172-176. doi.org/10.4028/www.scientific.net/AMM.34-35.172

[3] Kostiantyn Afanasenko. Electrical ignition sources for critical infrastructure facilities. 3rd International Conference on Central European Critical Infrastructure Protection. November 15th 2021, Budapest, Hungary. P. 13. URL:http://i-rzeczoznawca.pl/en/no-1-2021/.

[4] Bin Li, Ying Wu, Research on Ignition Characteristic of Short-Circuit Fault. Advanced Materials Research.2013. № 740. P. 496-501. https://doi:/10.4028/www.scientific.net/AMR.740.496.

Máté Kovács - Sándor Rácz - Norbert Szél

Developing safe water rescue competences and methodological assessment in youth education

Abstract

In our research, we will present the work of the diving service and the fire diving service, as well as statistics on water damage. We will describe the basic rules of water rescue, the dangers of the waters, proper instructor communication, teaching methods and the role of disaster management in education. We will discuss the preparation process and the results of the research, and finally we will summarize the experiences of the thesis.

Keywords: Water rescue, education, diving service, assistance.

Introduction

In our research we will present the place and role of the topic in disaster management, our research objectives, its preparation, our chosen research methods. We will describe the results of my research, including the students' knowledge levels before and after the research, the effectiveness of the teaching methods used, and finally we will summarise our experiences during our research. During our work, we have often found that witnesses and victims of water accidents are not aware of the dangers waters and the basic rules of water rescue. During our research, we examined the diving service's injury records for the past 5 years up to August 2022, with a total of 92 deaths. By examining the circumstances of the accidents, we found that this fatality rate could be reduced by 42.5% if the person involved in the accident followed the rules of swimming, wore a life jacket when using water sports equipment, or if bystanders at the scene provided professional assistance when they saw a drowning person. This fatality rate may seem high, but effective lifesaving in the diving service is rare, because by the time divers arrive on the scene and are ready to rescue, the accident has usually already ended in tragedy. In case of a person in distress in the water, rapid intervention is the most important thing, so lifesaving may be carried out by those on the scene, who are usually not professionals, do not have the necessary knowledge to rescue from the water and without this knowledge can easily put themselves in danger. The best way to learn about water rescue is in schools, where they can learn about the equipment needed for water rescue, the rules of water rescue and the dangers of water in a controlled classroom setting. A total of 113 students took part in our research, 96.5% of whom had learned to swim in a school setting, but only 6.2% of whom had ever taken a lifeguarding course. In 2022, the diving service was also involved in the search for 3 minors who lost their lives while swimming in a restricted area, so this year shows how important it is to teach students about the dangers of water and how to help their peers or even themselves in an emergency.

Objectives

The primary objective of our research is to assess the level of knowledge and personal attitudes of students towards water rescue, thus highlighting the need to introduce water rescue education in the National Curriculum. In order to provide effective education, it is necessary to arouse students' interest in the subject, and therefore it is necessary to find the most effective teaching method: the aim of our

thesis is to determine which teaching methods are the most effective in acquiring knowledge, and thus to provide students with an appropriate ratio of theoretical and practical instruction. The main aim of our research is therefore to monitor the development of young people and to use the results to justify the introduction of a system of teaching lifeguarding.

Methods

We started our research with a preliminary survey, based on the results of which, we prepared a lecture, which we gave to the students in 4 lessons, and then we conducted a follow-up survey to assess their progress. We used 4 different teaching methods: lecture, demonstration, discussion and project work. During the teacher lecture, the students listened to a slide presentation with a series of slides from me, in which the students learned about the dangers of water, ways to help and water rescue equipment. To illustrate, we made educational videos which were shown in class. From these videos, the students learned about the importance of wearing a life jacket correctly, the use of a life horseshoe and different water rescue techniques. During the discussion, the students were able to try out the tools provided in the lesson, such as life jackets, life horseshoes, life rings and drum bags. The students asked questions about them, which we discussed together. During the project work they took part in a pre-made online quiz game, which could be solved in groups or individually.

The questionnaires for the survey were filled in on paper by the students, which we also had written up before and after the lecture in a classroom session. We mainly used closed questions in the test because they were easier to evaluate and in order to determine the effectiveness of the teaching methods, we grouped the questions according to what was learned during the method. We started the pre-questionnaire with an attitude test to see how the gender of the students, their sporting habits or the number of siblings they had influenced their willingness to help, followed by an 18-question test which they were also asked to answer in the post-test. In the follow-up questionnaire, the attitude test was replaced by a feedback questionnaire in which students could write down their opinions about education.

Findings/Results

The results of the preliminary questionnaire showed that students are overconfident. They rate their swimming skills highly, with 76.1% of them saying they can swim well or very well. Their willingness to help is high, 78.7% would help a person in trouble in the water and 58.1% of those using water sports equipment do not wear life jackets. There were also differences in their personal attitudes, with men, those with siblings and those playing team sports being more likely to choose direct assistance. Figure 1. also shows that despite the overconfidence in choosing how to help, the majority of students, 57.5%, would prefer to look for a person more experienced in water rescue if they saw a person in distress, but a high percentage of students said they would swim to a drowning person, so despite never having attended a water rescue course and never having had their water rescue skills assessed, they think that their swimming ability alone is sufficient to rescue a drowning person. The results show that the students are not aware of the dangers of water, they know incorrectly recorded signs of a drowning person, they know some of the water rescue equipment and none of its

use. Examining the answers, it can be concluded that they could easily put themselves in danger with their existing knowledge of water rescue.

During the presentation, the students showed great interest in the topic, asked many questions and actively participated in trying out the tools. The most activity was shown during the project work, with some classes asking for a repeat of the quiz despite being prompted. The project work was not evaluated by the questionnaires, as the quiz game was created from what was learned in class.

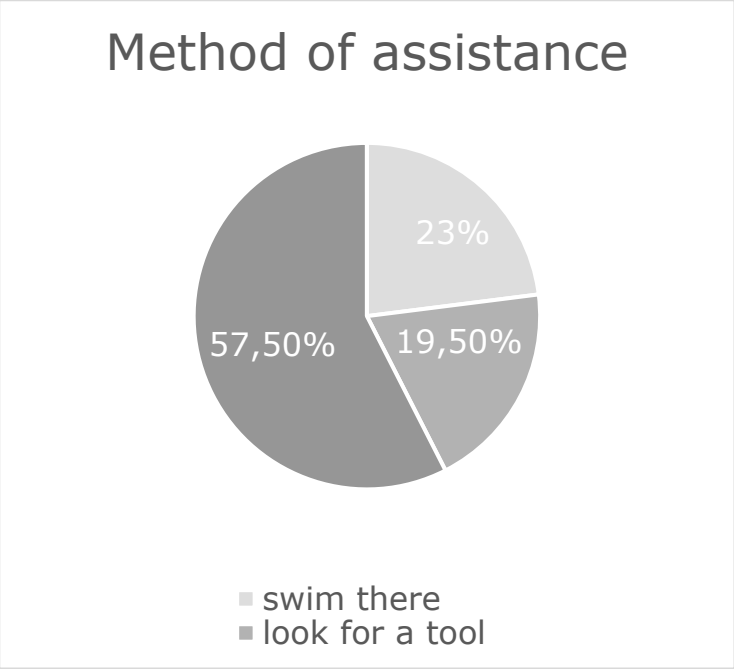
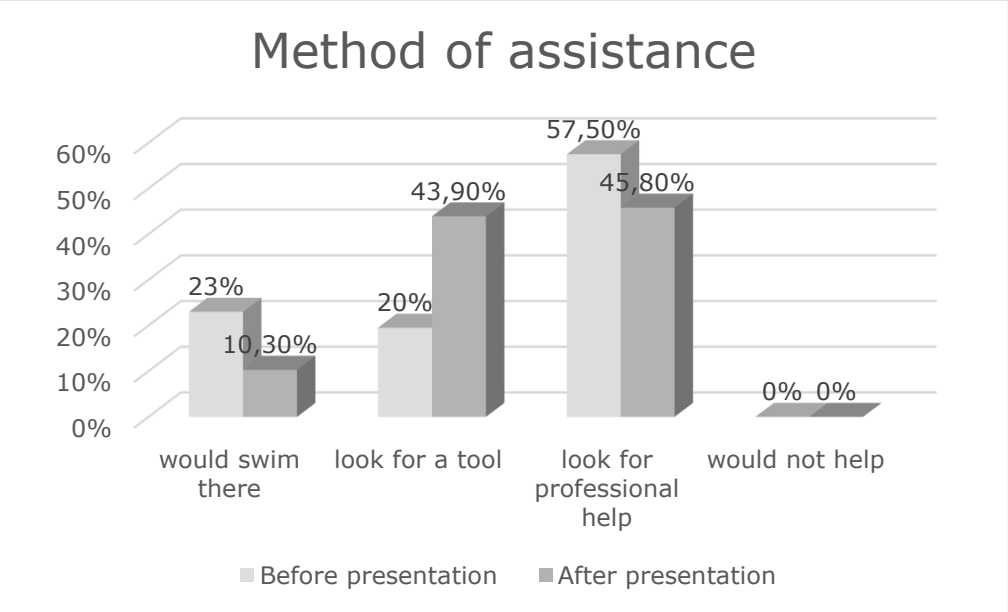


Figure 1: Students' choice of assistance

The results of the post-questionnaire showed a big improvement compared to the preliminary knowledge level. As a result of the presentations, the willingness of students to wear life jackets has changed: 18.5% more of those who use water sports equipment will now wear life jackets. Figure 2 shows that a higher percentage of students would choose direct assistance following training.



The number of people who would choose indirect assistance has decreased by 11.7% and, more importantly, the number of people who would swim to the person in distress has decreased by 12.7%.

The results of the test show an improvement of 65.4% on the question on water hazards, with students knowing the external signs of a drowning person but still not being able to distinguish between direct and indirect assistance. A broader understanding of water rescue equipment has been achieved and they know the function of a life jacket and the basic rules of rescue from water.

assignment	Teachers' lecture		Observation		Discussion	
	before	after	before	after	before	after
1.	15,9 %	81,3 %	24,8 %	43,9 %	90,3 %	99,1 %
2.	15 %	62,6 %	41,6 %	91,6 %	96,5 %	99,1 %
3.	28,3 %	37,4 %	20,4 %	96,3 %	80,5 %	95,3 %
4.	30,9 %	93 %	73,5 %	93,5 %	96,5 %	99,1 %
5.	18,6 %	86,9 %	94,7 %	91,6 %	17,7 %	92,5 %
6.	-	-	58,4 %	90,7 %	30,1 %	98,1 %

Table 1 - Percentage of good answers to the exercises

In Table no. 1 we have listed the proportion of good answers to the test questions. The first column shows the teacher presentation, the second the demonstration and the third the discussion set of questions. The questions for the teacher presentation were quite difficult, with low percentages of students achieving a good score before the presentation. We did not record the result for question 6, which was an open question "list 3 tools that can be found on the waterfront and used for water rescue". The important message of my lecture was that anything can be a water rescue tool that can be used to rescue a person in distress, so the students could not actually give a wrong answer to this question, but the lecture changed their thinking and they preferred to choose tools that could be easily found on the waterfront, but they did not consider it so important that the object had buoyancy.

The only drop in the proportion of good answers to the visualization questions is visible. The question was "can a person NOT panicking in the water assist in a rescue?". During our presentation we repeatedly highlighted that a person who is drowning will not help, they will be fighting for their life, so if we do not approach it professionally we could be pushed underwater. However, during the instructional videos, we emphasised during the rescue techniques demonstrated that they are applicable when the person in distress is not panicking, but simply needs help to swim out. In future lessons, more emphasis should be placed on teaching students

to distinguish between panicked and non-panicked individuals. The discussion questions proved to be easy, with the students achieving the best results in this group of questions. Overall, 50.5% improvement was achieved by the teacher's presentation and 28.6% by both the demonstration and the discussion. The project work as we mentioned was not assessed by the questionnaires so it is not comparable with the other 3 results, however the class that asked to repeat the exercise showed a 10% improvement on the first quiz and it is important to highlight that this teaching method is very good at helping students to retain the information they have been taught in class and is therefore an important part of their education. In order to determine the most effective teaching method, it was not sufficient to take into account progress. When grading the difficulty of the questions and averaging with progress, demonstration was found to be the most effective teaching method, so the greatest emphasis in curriculum design should be on practical demonstration.

Conclusions/suggestions

Feedback from the students shows that they are interested in water rescue, would like to learn about it in the classroom and even take part in practical training. The research results show that great progress can be achieved through education even in such a small number of lessons. In the future, it would be worthwhile to examine what progress can be achieved by supplementing practical training and at what intervals it is necessary to repeat the training and to refresh the information. The teaching of water rescue skills to students is necessary, and could be done without increasing the number of lessons, by integrating it into the physical education and swimming lessons, but it requires the training of students of physical education, because, as research has already shown, their knowledge is also lacking. During the preparation and training period, external lecturers and lifeguard instructors could help to impart knowledge. The results show how much the students have changed their mindsets about lifeguarding, and when they see a person in distress and provide professional, safe assistance, the education has saved not only the life of the person being rescued, but also the life of the rescuer.

References

[1] 46/2001. (XII. 27.) BM rendelet a szabad vízen való tartózkodás alapvető szabályairól. https://net.jogtar.hu/jogszabaly?docid=a0100046.bm

[2] Bihari Dávid Tamás; Bíró Melinda – A leendő testkultúrális szakemberek életmentéssel, vízből mentéssel kapcsolatos tudása – Debreceni Egyetem – 2016. https://dea.lib.unideb.hu/server/api/core/bitstreams/78aba200-ee45-4ca9-9f36-13c506ae88ef/content

[3] BM OKF – KAP elektronikus információs rendszer – statisztikai adatok

[4] Mario Vittone; Bagyó Nóra; Bagyó Sándor – A vízbe fulladás nem úgy néz ki, mint egy fulladás – 2018.05.08. https://kepmas.hu/hu/a-vizbe-fulladas-nem-ugy-nez-ki-mint-egy-fulladas

[5] Rácz Sándor - Pántya Péter - BOLYAI szemle 2014/3 – Vízben végrehajtott mentés oktatása és annak tapasztalatai a Katasztrófavédelmi Oktatási Központban, valamint a Nemzeti Közszolgálati Egyetemen.https://nkerepo.uni-nke.hu/xmlui/bitstream/handle/123456789/13906/V%EDzben%20v%E9gr

ehajtott%20ment%E9s%20oktat%E1sa%20%E9s%20annak%20tapasztalatai%20a%20Katasztr%F3fav%E9delmi%20Oktat%E1si%20K%F6zpontban,%20valamint%20a%20Nemzeti%20K%F6zszolg%E1lati%20Egyetemen.pdf;jsessionid=946E5453EBE28132653FCF14B8726DEA?sequence=1

[6] Skoll – A didaktikai feladatok és az oktatási módszerek, munkaformák – 2020.07.16. https://skoll.hu/oktatasi-es-pedagogiai-modszerek-tanitas-a-gyakorlatban/

[7] Varga Ferenc: Structural and operational model for volunteer fire brigades. *Hadmérnök*, 13. 2. (2018), pp. 345-359.

[8] Restás Ágoston - Johannes Belle - Alice Ncube - Roman Tandlich - Siviwe Shwababa - Vass Gyula - Kováts Antónia - Bodnár László: Effect of extreme weather conditions to the defence sector - similarities and differences in Europe and Africa. *Polgári Védelmi Szemle*, 14. DAREnet projekt Különszám 2022 pp. 249-260. Paper: 12 , 12 p. (2022).

[9] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. *Polgári Védelmi Szemle*, 14. Darenet Projekt Különszám (2022), pp. 116-131.

[10] Slašťan Kristián - Svetlík Jozef - Pántya Péter: Criteria for Fire Water Sources Assessment in Slovakia and Hungary. *Polgári Védelmi Szemle,* 15. DAREnet projekt Különszám (2023), pp. 170-178.

Abdalrahman R. Qubaa - Taha A. AlJawwadi - Lubna M. Saeed - Agoston Restas

UAVs/Drones for Vegetation Fire Detection and Monitoring

Abstract

Forest fires and plant cover are serious natural hazards that inflict economic loss, human mortality, and environmental damage. The globe has experienced a rise in frequency intensity and frequency in recent years. Real-time fire monitoring has always been a major challenge in protecting forests and crops, especially in the huge area, where late monitoring often leads to huge financial losses and may be human losses. Therefore, the goal of the vegetation industry is the prevention and control of forest fires, early detection and early rescue. Technological advances in drones, remote sensing and information processing have made it possible to analyze images in real time, allowing the use of aerial images of huge forests to detect fires. This is in addition to the ability of this modern technology to detect the gases emitted from these fires and monitor their movement to alert decision makers to take warning and rescue operations. In this research, the process of using a drone for the first time in Nineveh Governorate in Iraq to help the Civil Defense Forces in fighting a big forest fire in real time is discussed. GIS software and satellite data, along with drone data, were used to analyze fire to help deduce the area and fire direction. The resulting losses were also counted to estimating the amount of trees that will be replaced to revive the lost forest area.

Keywords: UAVs, Wildfire, Forest fire detecting, Forest fire monitoring, Remote Sensing, Firefighters.

Introduction

Due to their fast maneuverability, extended operating range, and improved personnel safety, unmanned aerial vehicles (UAVs) with vision-based systems have great potential to monitor and control vegetation fires whether they are field crops or dense forests[1,2]. Over the past decade, drone-based field crop and forest firefighting technology has shown promising and increasing results [3]. In rural and protected areas, wild and agricultural land fires pose a serious risk. Because of their tendency to spread rapidly, burning large areas of the country and getting close to cities and urban areas, these lands are difficult to control and mitigate [4]. Wilderness areas have a significant negative impact on the economy, environment and climate [5]. In our country, Iraq, a lot of fires occur on field crops and even on some forests, which requires the use of modern methods such drones to combat them and reduce their effects and risks[6]. For example, fires occur in the Mosul city/Nineveh Government in agricultural lands almost annually, especially when the maturity of these crops, including wheat and barley, approaches. In 2019, fires occurred in the northwest of the Mosul city in 13 areas in agricultural field at the same time, Figure 1, which made the firefighting teams unable to control these fires and the displacement of more than 600 families, a large number of nearby residents, as a result of the spread of thick smoke in their areas. During the 48 hours, the fires engulfed four villages in the districts of Mosul, reaching the outskirts of the city of Mosul; what prompted the Iraqi army security forces to announce the general mobilization of its forces to support the civil teams in extinguishing the fires.

Figure 1 - Fires occurred in the northwest of the Mosul city in 13 areas at the same time in crop fields.

Another example occurred in Mosul city, which was the burning of parts of the Mosul forest occurred on 9/6/2022, which extended to burn more than 6.5 hectares. Civil Defense sources stated that 13 fire brigades and 16 specialized fire trucks participated in extinguishing this huge fire, in addition to 9 tank cars from the Water Directorate and 16 tank cars from the Sanitation Directorate of Nineveh Governorate.

Objective

In this research, the process of using a drone for the first time in Nineveh Governorate in Iraq to help the Civil Defense Forces in fighting a big forest fire in real time occurred in Mosul forest on 9/6/2022 is discussed. GIS software and satellite data, along with drone data, were used to analyze the fire to help deduce the area and direction of the fire. The resulting losses were also counted to estimating the amount of trees that will be replaced to revive the lost forest area.

Methods

A DJI Mavic3 drone was used on the day of the fire to provide the Civil Defense Forces with information such as the extent of the fire, its spread, and any directions, which helped in limiting the area of the fire and determining its area. After the fire, the available information was analyzed and drone images with a ground resolution of 10 cm were used for the area taken before the fire occurred with Landsat satellite images and ArcMap 10.3 software to analyze the data and get useful information such as conclude the perimeter and area of the fire-affected area accurately.

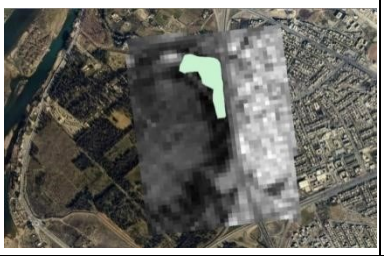
Results

Figure 2 showed the drone image taken for the Mosul city forest fires which led to the burning of trees of different types such as pine, elm, eucalyptus, and asparagus, carpenter, and rice. Simple drones were used for the purpose of determining the direction of the fire and limiting its areas and providing officials with this information to take the appropriate decision in combating it and determining its damage. Also, drone images were used for the post-fire phase to limit the damage and direct the cadres to clean and rehabilitate the area.

Figure 2 - Using Drones in the Mosul city forest fires. Officials were provided with information to take the appropriate decision in fighting the fire and determine its damages,(9/Jun/2022).

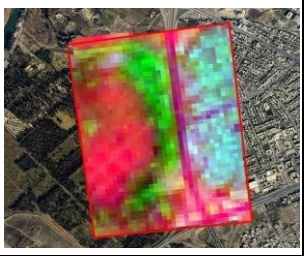
Figure 3 shows drone image with ground resolution accuracy of 10 cm for the study area, on which the fire area is defined by a polygon, which was calculated from ArcMap Program and amounted to 6.5 hectares. Compared with Figure 4, which represents Landsat satellite images with a ground resolution of 30 m, the drone image has the advantage in eliciting information. For example, it is possible to deduce the number of burnt trees from the drone image, unlike the satellite images. If the distance between the two eucalyptus trees is 3 meters, this means that the burned area accommodates approximately 7,000 trees.

Figure 3: Drone Image for the fire study area, (10 cm Resolution).



A

B



C

Figure 4: Satellite Images (30m Resolution). A: Landsat 9 Band4 (7-62022) before the fire. B: Landsat 8 Band4 (15-6-2022) after the fire. C: Color composite between 3 Landsat 8 Satellite bands.

Conclusion

For the first time in Mosul Governorate, drones have been used to help fight a forest fire. Through the inclined aerial photographs captured by the drone during the fire and compared with the high-resolution vertical drone images, we were able to identify the burned area and find its area. It was also possible to find the direction of the wind that could be fixed on the map, as well as from the calculations of the area covered by one tree, it was possible to predict the number of trees that burned and what is the number of trees that can be replaced. There is no doubt that satellite data has more comprehensive coverage and multiple spectral discrimination, but the discriminatory power of this data does not enable us to monitor such incidents with high accuracy, which made relying on drones more successful in verifying these cases, especially within cities.

Finally, officials in the Civil Defense Directorates in Iraq should use and develop their capabilities with regard to the use of drone technology to predict fires and assist in the management and control of firefighting operations.

References

[1] A. Hossain, Y. Zhang and C. Yuan, "A survey on forest fire monitoring using unmanned aerial vehicles", 2019 3rd International Symposium on Autonomous Systems (ISAS), pp. 484-489, 2019.

[2] V. Sherstjuk, M. Zharikova and I. Sokol, "Forest fire-fighting monitoring system based on UAV team and remote sensing", 2018 IEEE 38th International Conference on Electronics and Nanotechnology (ELNANO), pp. 663-668, 2018.

[3] R. Vimalkumar and K Karan, "Design and development of heavy drone for firefighting operation", International Journal of Engineering and Technical Research, vol. 9, pp. 663-668, 2020.

[4] Yuan, Chi & Zhang, Youmin & Liu, Zhixiang, "A Survey on Technologies for Automatic Forest Fire Monitoring, Detection and Fighting Using UAVs and Remote Sensing Techniques" Canadian Journal of Forest Research. 45. 150312143318009. 10.1139/cjfr-2014-0347, 2015.

[5] Yongtuo Zhang, Sheng Chen, Weiyi Wang, Wei Zhang and Li Zhang,"Pyramid Attention Based Early Forest Fire Detection Using UAV Imagery", Journal of Physics: Conference Series, 2363 , 2021.

[6] Qubaa, A.R., Aljawwadi, T.A., Hamdoon, A.N., Mohammed, R.M., "Using UAVs/Drones and vegetation indices in the visible spectrum to monitoring agricultural lands", Iraqi Journal of Agricultural Sciences, 52(3), pp. 601–610, 2021.

Balázs Tóth – Ágoston Restás

Measuring the sustainability of attention and concentration during firefighting interventions with the pieron test

Abstract

The people involved in the firefighting process, be they managers or subordinates, are constantly forced to make decisions and need divided attention due to the complex tasks. Valuable information is mostly in the possession of the manager, he evaluates it and makes his decisions based on it. During the interventions, due to the physical strain, their body temperature rises, the consequence of the rise in temperature is the deterioration of the ability to concentrate and loss of information. My goal is to demonstrate with figures what this means during a firefighting intervention. I use the appropriate Pieron test to measure the ability to concentrate. In my research, I use the results of my non-representative survey.
Keywords: firefighter, Pieron test, heat stress, decision-making, physical stress

Since most of the tasks performed by firefighters require the use of personal protective equipment, which inhibits normal thermoregulation during exercise, uncompensable heat stress occurs. Every day, firefighters have to make decisions that require them to choose between several alternatives and ultimately arrive at an optimal decision. [1] According to research, people use two systems: simple and complex decision-making. [2] More specifically, "fast" decisions are automatic, based on known patterns. The other is the "slow" form of decision-making, which requires more effort and focus and is therefore more analytical. [3] The application of "fast" and "slow" decisions can also be observed in real situations during firefighting or technical rescue. A more routine firefighter primarily relies on "quick" decisions during intervention and control, since the few unknown situations do not require "slow", more complex thinking. One factor that can threaten to keep events under control is stress. [4] Heat stress has a particularly harmful effect on good situational awareness. [5] The performance response to thermal (heat) stress shows that heat stress can cause interventionists to reallocate attentional resources to assess the thermal state and compensate for it. All of this affects and reduces the ability to process information related to the task [6]. In my research, I use the results of my non-representative survey. One volunteer firefighter from the intervention staff will take part in the survey. I would like to verify my findings based on my own experiences with the results of outside firefighters who are not familiar with the test method for the loss of attention that I experienced.
Using the Pieron test, it is possible to quantify the decrease in mental focus as a result of the increase in core temperature and heat stress. The tested person completes the test in a state of rest at normal temperature (A1) and in a state exposed to increased physical and thermal stress (elevated body temperature), wearing firefighter's protective clothing (A2). During the stress test, the protective clothing and breathing apparatus added 19.2 kilograms of extra weight, so the total weight at the time of the test was 116 kilograms. In the case of the examined firefighter, this extra weight means that he was carrying 19.83% more weight than his own body weight during the treadmill test. In the first step, the measurement was carried out in a state of rest, without any kind of load, and in the second step, in full protective equipment, with increased physical stress. Simulating vigorous work, he ran on a treadmill for fifteen minutes, thanks to which a continuous rise

in the body's core temperature could be measured. I recorded the starting state, which can be considered as a starting point, in a table. I set the duration of the load at fifteen minutes because the first few minutes can be decisive during interventions, during which increased control and attention are needed. I divided the measurement into three 5-minute sections, during which I measured the subject's body temperature, heart rate and blood oxygen level. As the load gradually increased, the evaporation on the skin surface increased significantly, so the measured value is not always completely accurate. In this case, the temperature measured on the skin surface differs by 0.5 degrees Celsius from the internal core temperature in a negative direction, so 0.5 degrees Celsius was added to the value measured with the digital thermometer.

Table 1 - Prepared by the author.

Time	**Speed**	**Temperature**	**Pulse**	**VO2**
Initial state	0 km/h	36.7	75	98
5.min	7.7 km/h	36.8	103	98
10.min	10-12 km/h	36.9	134	98
15.min	12-16 km/h	37.9	146	98

In the second step, the attention test followed, which contains a total of 400 signs in 20 lines. 4 separate signs are given, these must be distinguished from the others and marked. The second test sheet contains 40 figures per row (1,600 in total), 10 of which match the two symbols to be selected. For this measurement, the examined person also had 3 minutes at his disposal. Thus, a total of 6 minutes were available to fill in the two similar pages without a break. This unit of time is roughly equivalent to the time it takes an experienced firefighter to change a breathing cylinder. During this time, you must be able to select the important ones from the flood of impulses and information, and concentrate and reflect on them.

Table 2 - Prepared by the author.

Pieron test	**First test sheet**	**Second test sheet**	**Summarization**	**Hit in %**
Rest state "A1"	*100/99* *99%*	*80/64* *80%*	*180/163* *90%*	***90%***
Load state "A2"	*100/84* *84%*	*80/52* *65%*	*180/136* *75%*	***75%***

Analyzing the data in the table, it can be concluded that there are significant differences between the state of rest and the state of stress. In my opinion, the number of correctly marked figures corresponds to the processed and recorded information, and the number of hits shows the ratio, which is the difference between the two states. In this case, compared to the achievable maximum, the deviation is 25% in the negative direction, if we take it as 100%. If the results of the first completed test are defined as 100%, then the difference is 15%. This can also mean that we can only properly concentrate on 136 of the 180 impulses that hit us during work. After the two types of measurements (A1-A2), a combined diagram can be used to trace the decrease in mental performance as a result of the increase in body temperature and heart rate.

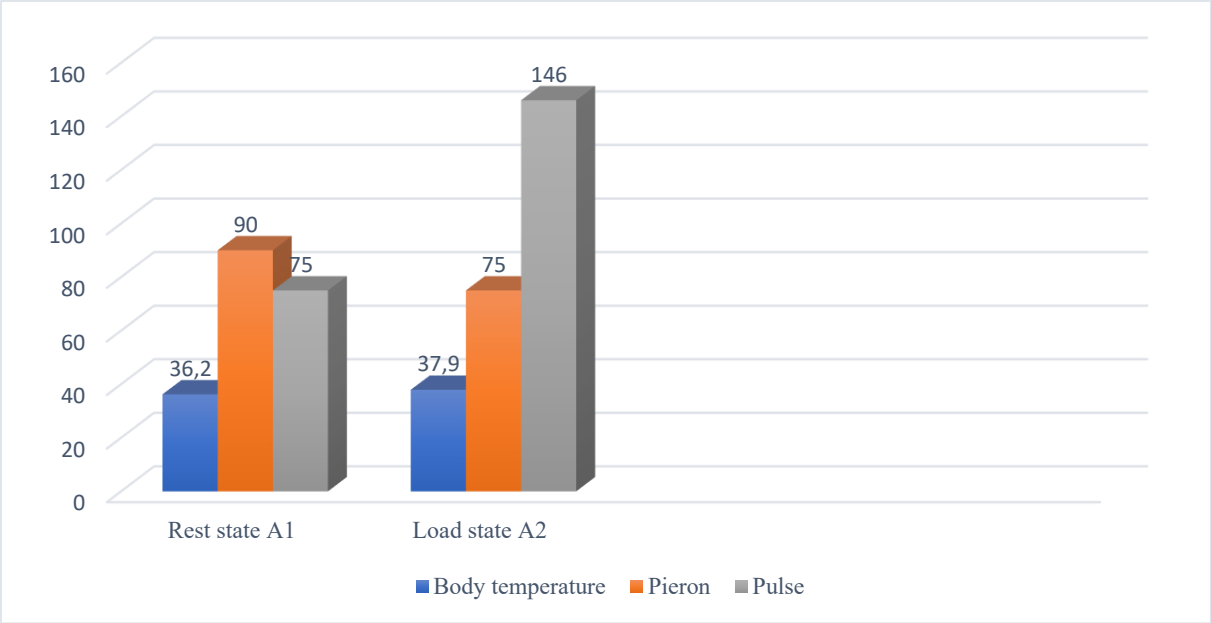


Figure 1 - Prepared by the author.

References

[1] A.G. Sanfey, Social decision-making: insights from game theory and neuroscience, Science 318 (5850) (2007) 598–602

[2] D. Kahneman, Thinking, Fast and Slow, Farrar, Straus and Giroux, New York, 2011.

[3] K.E. Stanovich, R.F. West, Individual differences in reasoning: implications for the rationality debate? Behav. Brain Sci. 23 (5) (2000), 645-665-726

[4] G. Keinan, Decision making under stress: scanning of alternatives under controllable and uncontrollable threats, J. Pers. Soc. Psychol. 52 (3) (1987) 639.

[5] A. Cheema, V.M. Patrick, Influence of warm versus cool temperatures on consumer choice: a resource depletion account, J. Market. Res. 49 (6) (2012) 984–995.

[6] P.A. Hancock, J.M. Ross, J.L. Szalma, A meta-analysis of performance response under thermal stressors, Hum. Factors 49 (2007) 851–877.

[7] Bodnár László: Examination of the carried overload for firefighters with a physical load test. *Védelem Tudomány*, 6. 3. (2021), pp. 513-530.

[8] Ragács Nikoletta - Elek Barbara: Energiahatékonyság és/vagy tűzvédelem? Védelem Tudomány, 3. 2. (2018), pp. 51-66

[9] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. Polgári Védelmi Szemle, 14. DAREnet projekt Különszám (2022), pp. 116-131.

Krisztián Németh

Drone usage in forest fires

Abstract

Fire incidents have been a part of our lives since we discovered the fire. I think as long as the human factor is there, it will be fire-related damages, so the most important thing is to respond appropriately to these damages. One of the most dangerous fire type is forest fire. There is bad visibility and difficult accessibility at this type of fire, so you need to get more, precise, and exact information about the fire. In the discovery phase the most effective way to get information is to using drones. I am fascinated by the world of aviation and airplanes, since I was a child, and nowdays the most used airplane types are those that fly without a pilot. I decided on this topic because I come from a county, where forest fires are very common. In most counties, these forests do not form large contiguous areas like in this county, because here, we can speak about continuous forest areas. Those contiguous forest areas has mixed tree species, so the natural and man-made fires here can be extremely dangerous and unpredictable, which makes the firefighters job harder, and more riskier. In my project, I would like to help the work of the firefighters, ask for their opinion and turn the attention for the possible application of drones, and their usage, and prove that if we use them, we could eliminate minor errors and ensure faster and more precise work.
Keywords: Unmanned Aerial Vehicle (UAV), Unmanned Aerial System (UAS), forest fire, drone usage, survey

Objective

My goal was to find out that is there any need for drone usage, and if there is, then in which cases would it be necessary. I also wanted know what's the firefighter crew's opinion about the topic, and wanted to earn at least 1% of the firefighters, which means around 50-60 filler. My main method was survey. This survey was made in Google forms. This is very easy was to make survey, and share with the fillers.

Methods

I analysed the relevant national and international literatures in the topic. I have also created a survey and asked the firefighters experiences. I illustrated the results in several figures.

Results

After the data analyses it become clear according to the firefighter opinion that the drone usage has sense in som many different accidents. Of all 30 classification questions I received 26 where the rating was 5 grade on higher in a 10 skale. This means 86,6% of the firefighters think that the drone usage is rather useful in almost every case. I received the biggest value for those questions where human life could be highly risked.

Those were:

- Interventions in the present of dangerous substances
- Interventions in case of large forest fires

- Interventions in the presence of nuclear facilities and nuclear material
- Interventions in case of damaged gas lines.

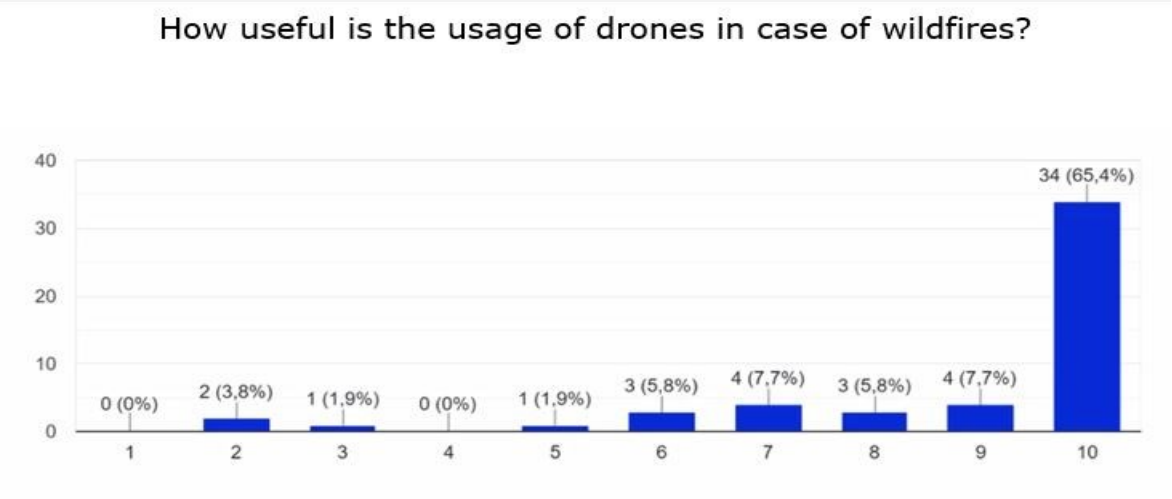


Figure 1 – Application of drones in case of wildfires. Created by the Author.

References

[1] Ágoston Restás: Drone swarm technology as a competitive alternative to traditional aerial firefighting, In: D.X. Viegas (ed.) Advances in Forest Fire Research 2022, Coimbra, Portugal, University of Coimbra (2022) pp. 1612-1615. ISBN: 9789892622972

[2] Bodnár László - Restás Ágoston - Xu Qiang: Conceptual Approach of Measuring the Professional and Economic Effectiveness of Drone Applications Supporting Forest fire Management, *Procedia Engineering,* 211 (2018), pp. 8-17. doi:10.1016/j.proeng.2017.12.13.

[3] Restás, Ágoston: A pilóta nélküli repülőgépek (UAV) erdőtüzeknél történő alkalmazásának strukturált felosztása; *Repüléstudományi Közlemények* 24 : 2 (2012), pp. 622-633.

[4] Restás, Ágoston: The Regulation Unmanned Aerial Vehicle of the Szendro Fire Department Supporting Fighting Against Forest Fires 1st of the World! *Forest Ecology And Management* 234 : Suppl. Paper: S 233 (2006) doi: 10.1016/j.foreco.2006.08.260

[5] Restás, Ágoston: Wildfire Management Supported by UAV Based Air Reconnaissance: Experiments and Results at the Szendro Fire Department, Hungary, In: F.H. Martínez (ed.) Fourth International Symposium on Sustainable Management of Forest Resources (SIMFOR 2006) : First International Workshop on Fire Management, Havanna, Kuba (2006).

[6] Sereg Adrienn - Kerekes Zsuzsanna - Elek Barbara: Az erdők környezeti vegetációjának hatása a tűzesetekre, a megelőzés egyes lehetőségei. Védelem Tudomány, 4. 4. (2019), pp. 75-90. , 16 p.

[7] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. *Polgári Védelmi Szemle*, 14. DAREnet projekt Különszám (2022), pp. 116-131.

József Zsolt Kersák - Péter Pántya

Technical development opportunities in the field of practical training

Abstract

Professional and volunteer firefighters need to have a high level of competence in order to deal with firefighting incidents. In order to acquire professional practical knowledge, practice-oriented training is needed. A disadvantage is that firefighters only encounter with stressed woodcutters in case of interventions, otherwise they cannot practice the cutting techniques. One of the Authors created a structure that simulates the mechanical stress of the wooden parts. The structure may have several functions in the future. Based on the experiments, a new cutting technology can be created for the safer intervention.
Keywords: interventions, mechanical stress of wooden parts, cutting technique

Introduction

Based on previous research, the authors determined that the number of rescue operations is increasing in relation to the number of firefighting [1]. The number of storm damages within technical rescues is high. It has been shown that the use of a rescue saw is minimal compared to a power saw, presumably because of its specific application. It was observed that the use of power saws increased in parallel with the increase in the number of tree falls incidents. During a tree fall or storm damage, the parts of the tree are under tension. Their removal requires special knowledge and cutting technology. It is a problemthat firefighters only encounter with stressed woodcutters in case of interventions, otherwise they cannot practice the cutting techniques. The authors' research found that the use of a structure simulating the stress of wooden parts could be effective in case of fire interventions. This would provide a high level of preparedness in the field of practical training [2] [3] [4].

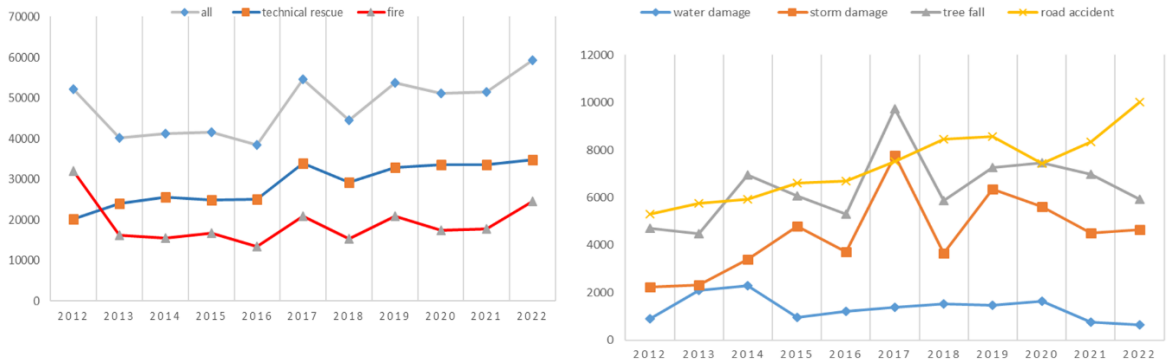


Figure 1 – Montage: left side - type of incident and classification by intervention, right side - type of damage. Created: József Zsolt Kersák[5]

Demonstration of a structure simulating the tension of wooden parts

The construction of the structure required an extensive design work. The primary concern is to ensure that it performs its function in a professional manner, while offering maximum usability. The design work was followed by the physical implementation of the structure. At the moment, the experimental process is being prepared.

Picture 1 - Structure simulating the tension of wooden parts. Created by József Zsolt Kersák, Balatonszabadi 2023. 04. 11.11.

In Picture 1, we can see the device in use. On the left side we can see the hydraulic tensioning unit, which can be positioned 360°. On the left is the hydraulic unit for fixing the wood.

Figure 2 - Montage of a structure simulating the tension of wooden parts. Created by: Kersák József Zsolt, Balatonszabadi 2023. 04. 11.

The left side of the montage shows the structure from a different angle, while the right side shows the 360° adjustable hydraulic tensioning unit, the manual

hydraulic power supply and the pressure gauge. The pressure gauge is an indispensable element for carrying out the experiment. It is used to calculate the force acting on a hydraulically pressurised wooden part under tension (mechanical).

Compressive force = pressure * compressed surface

The values obtained can be used to test the depth of the load-bearing cut in the tree in relation to the compressive force.

Results

A structure that simulates the tension of wooden parts could serve several functions in the future. Based on the experiments and the results, a new cutting technology can be developed for the safer intervention.

Furthermore, the use of the structure in the practical training of fire brigades could provide a high level of preparedness in response to incidents (e.g. storm damage).

References

[1] Restás Ágoston: A hivatásos katasztrófavédelmi szervek beavatkozói tevékenysége az éghajlatváltozás okozta károk felszámolásánál, In: Földi, László; Hegedűs, Hajnalka (szerk.) , Budapest, Magyarország : Nemzeti Közszolgálati Egyetem, (2019) pp. 584-614.

[2] Restás Ágoston - Pántya Péter - Rácz Sándor - Érces Gergő - Hesz József - Bodnár László: A komplexitás értelmezése a Tűzvédelmi és Mentésirányítási Tanszék oktatási és kutatási tevékenységében, In: Vass, Gyula; Restás, Ágoston; Bodnár, László (szerk.) Tűzoltó Szakmai Nap 2018 ” Tudományos Konferencia": A XXI. századi biztonsági kihívások hatásai a magyar katasztrófavédelemre, Budapest, Magyarország: Belügyminisztérium Országos Katasztrófavédelmi Főigazgatósága (2018) 233 p. pp. 228-232. ISBN: 9786158042963

[3] Rácz Sándor: Tűzoltók kiképzésének fejlesztési lehetőségei. Védelem Tudomány, III.4. (2018), pp. 182-199.

[4] Kersák József Zsolt - Pántya Péter: Opportunity for technical development in the field of practical training in case of technical rescue. Védelem Tudomány, 6. 3. (2021), pp. 224-233.

[5] On-line Katasztrófavédelmi Adatszolgáltató Program (on-line KAP) https://kap.katved.gov.hu/adatlekeres.aspx (letöltés: 2021. 01. 15.)

[6] Huszka Zsolt - Rácz Sándor - Bodnár László: Hazards and occupational safety of firefighting interventions. *American Journal of Research Education And Development*, 2021/2 pp. 27-37. , 11 p.

[7] Finta Viktória - Rácz Sándor: Firefighter Intervention in Radiological Emergencies. In: Milanko, Verica; Laban, Mirjana; Mračkova, Eva (szerk.) 5th International Scientific Conference on Safety Engineering and 15th International Conference on Fire and Explosion Protection. Novi Sad, Szerbia : University of Novi Sad, Faculty of Technical Sciences (2016) 530 p. pp. 180-186.

[8] Bodnár László: Examination of the carried overload for firefighters with a physical load test. Védelem Tudomány, 6. 3. (2021), pp. 513-530.

Section D – Disaster management

Csaba Sándor Almási –Zsolt Cimer – Lajos Kátai-Urbán –Ferenc Varga

The history of the development of international regulations for the transport of dangerous goods by road

Abstract

The authors shortly describe the international organisations of the transport of dangerous goods, the history of its development, its main stages and the most serious accidents. The research method is a review of international and national literature and an analysis of the relevant legislation and related documents.
Keywords: ADR, flammable substances, accident, history.

Introduction

The transport of dangerous goods by road is subject to strict international regulations. The name of this regulation system is "Agreement on the International Carriage of Dangerous Goods by Road (ADR)". Strict regulation of the transport of dangerous goods by road is of paramount importance, as a road accident can create a major hazard area through the release of dangerous substances. Historical experiences show that the most serious accidents were caused by flammable substances, liquids and gases. In Hungary the ADR was promulgated in 1979, after a serious accident occurred in Aszód, where a tanker carrying liquid ethylene overturned and caught fire.

Dynamic development after the Second World War

The first written regulations on the transport of dangerous goods by road date back to the late 18th century in Germany. The first regulations on the securing of loads were published in Münster in 1789, followed by the "Safety Regulations for the Transport of Gunpowder", issued in Berlin on 19 June 1799. [1]
After the Second World War, the United Nations (UN) was established in 1945, and one of its main organs, the United Nations Economic and Social Council (ECOSOC), set up the United Nations Economic Commission for Europe (UNECE) in 1947 with the main objective of promoting European economic integration. [2]
The UNECE has a long history of promoting road safety. [3] After the Second World War, as road networks continued to expand, the regulation of the transport of dangerous goods by road became increasingly important. The United Nations General Assembly and its Regional Commissions have been working on the development of regulations for the transport of dangerous goods practically since the post-war period. The first study of the subject of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was tabled in 1950, [4] finally concluded in Geneva on 30 September 1957 and entered into force with its Annexes on 29 January 1968. Article 14 (3) was amended on 21

August 1975 in the New York Protocol, which has been in force since 19 April 1985. [5]
The hierarchical institutional structure of the international regulation of the carriage of dangerous goods, involving several bodies, is as follows. The Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals, which is attached to the UNECE Secretariat, acts as a complementary body of governmental experts to ECOSOC. [6]
The Sub-Committee of Experts on the Transport of Dangerous Goods (TDG) of the above dual body is responsible for the development of the "Recommendations on the Transport of Dangerous Goods, Model Regulations", referred to in the trade as the "Orange Book". The first Model Regulations was issued in 1956. [7]
The regulation of the transport of radioactive material requires specific expertise, and the International Atomic Energy Agency (IAEA) coordinates the Regulations for the Safe Transport of Radioactive Material. [8]
Based on the Model Regulations, the UNECE Intergovernmental Organisation's Inland Transport Committee (ITC) Working Party on the Transport of Dangerous Goods (WP.15) has been preparing amendments to the ADR every odd year since 1957.
By 2023, 54 states have ratified the ADR. [9]

Major accidents in the transport of dangerous goods at national and international level

A number of accidents has affected the regulation of the transport of dangerous goods by road, but the events discussed below are of landmark importance both domestically and internationally.
In September 1976, in Aszód, a tractor-trailer carrying liquid ethylene overturned on a left-hand bend and crashed into a building. The accident caused the tank and the transport vehicle to catch fire. According to witnesses, the driver getting out of the crashed cab and opening a safety valve caused the explosion. The tanker remained on fire for more than twenty hours. Rescue crews found a woman dead in the basement of the collapsed building the next day, while the driver, who suffered severe burns, died in hospital. [10] As a result of the ethylene accident, Hungarocamion started training ethylene drivers in 1977, and Hungary acceded to the ADR Agreement which entered into force in Hungary on the 18th day of August 1979. [11]

Figure 1 - Archival footage of the firefighting and technical rescue intervention at the accident in Aszód. [10]

The international application of ADR was triggered by a disaster in Spain on 11 July 1978, in circumstances that are still not fully understood. A tanker carrying 23 tonnes of liquefied propylene gas simply exploded as it was passing a coastal campsite near Tarragona (Camping de los Alfaques). The incident killed more than 200 people and injured 100 others. The official investigation concluded that the disaster was caused by an overpressure of liquefied petroleum gas. There was no pressure relief device fitted to the tank, it was overfilled and the external ambient temperature was high. [1] It is assumed that a boiling liquid expanding vapour explosion (BLEVE) occurred. [12] As a consequence of the accident, institutionalised training for drivers transporting dangerous goods has been started in Germany. [1] The ADR has required training for drivers of tank-vehicles since 1983, and compulsory testing since 1985.
A disaster on 7 July 1987 in Herborn, Germany, opened a new chapter in the history of ADR. On that day, just after 8.30 p.m., a tanker carrying 18 014 litres of super petrol, 10 019 litres of petrol and 6 032 litres of diesel oil overturned on its left side on a sharp right-hand bend at the junction of Hauptstrasse and Westerstrasse and drifted for tens of metres. The iron barrier of the pavement split the tank liner, the fuel escaped, flooded the road and flowed into the sewer system, and minutes later, it exploded. The fuel burned with flames 30-50 metres long, igniting buildings and surrounding vehicles. Twenty-eight fire brigades with ninety-three fire engines, thirty-nine rescue vehicles, four rescue helicopters and forty-three technical rescue vehicles with a total of 1 394 personnel carried out the rescue. The fire was contained by midnight. The probable cause of the accident was brake failure. During and as a result of the incident, 25 people were injured and nearly 50 people lost their lives. [13]
In Hungary, one of the main tasks of the professional Disaster Management body's Industrial Safety Department is to guarantee the highest possible level of safety in the transport of dangerous goods. [14]

Summary

The transport of dangerous goods poses an additional risk in all transport sectors, but an evaluation of the statistics and the accident risk of each transport mode leads to the conclusion that road transport poses the greatest risk. The administrative basis for the safety of the transport of dangerous goods by road is the UNECE Agreement concerning the International Carriage of Dangerous Goods by Road, which has been in force since 29 January 1968. The provisions of this Agreement have been applicable in Hungary since 1979. The transport of dangerous goods is an integral part of the functioning of the economy, and it is impossible to avoid that large quantities of them come into close proximity to the public. The investigation of material damage, the causes of injuries and deaths and the documentation of the circumstances are essential elements in the maintenance of public order. In the publication the authors point out that the most serious accidents were mostly caused by the transport of flammable liquids and flammable gases.

References

[1] Sárosi György: Az 50 éves ADR (1957-2007) történeti áttekintés, Balatonvilágos, 2007.Június 7-8.

[2] UNECE. Mission. URL: http://www.unece.org/mission.html (Download: 2023-04-12)

[3] UNECE. 50th Anniversary of the 1968. URL: Conventions: https://unece.org/50th-anniversary-1968-conventions (Download: 2023-04-12)

[4] UNECE. 50th anniversary. URL: https://unece.org/50th-anniversary-1968-conventions (Download: 2023-04-12)

[5] UNECE. Abot ADR. URL: https://unece.org/about-adr (Download: 2023-04-12)

[6] ECOSOC. Subsidiary bodies of ECOSOC. URL: https://www.un.org/ecosoc/en/content/ecosoc-subsidiary-bodies (Download: 2023-04-12)

[7] Guiding principles for the development of the UN Model Regulations. URL: http://www.unece.org/fileadmin/DAM/trans/danger/publi/unrec/GuidingPrinciples/Guiding_Principles_Rev18.pdf (Download: 2023-04-12)

[8] IAEA. Safe Transport of Radioactive Material. URL: https://www.iaea.org/publications/7519/safe-transport-of-radioactive-material (Download: 2023-04-12)

[9] UN Treaty Collection. URL: https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XI-B-14&chapter=11&clang=_en (Download: 2023-04-12)

[10] Aszódi Tükör, Aszód Város Közéleti Havilapja, XIX. évfolyam, 9. szám, 13. oldal, 2007. szeptember

[11] 1979. évi 19. törvényerejű rendelet a Veszélyes Áruk Nemzetközi Közúti Szállításáról szóló Európai Megállapodás kihirdetéséről

[12] UNECE. General information about „BLEVE", Transmitted by the Government of Spain. URL: http://www.unece.org/fileadmin/DAM/trans/doc/2010/wp15/WP15-89-INF6e.pdf (Download: 2023-04-12)

[13] Sárosi György: Herborni pokol, Camion Magazin, XXIV. évfolyam, 5. szám, 12. oldal, Hírhedt balesetek, 1992.

[14] Német Alexandra – Kátai Urbán Lajos – Vass Gyula: Veszélyes tevékenységek biztonsága a fenntarthatóság jegyében. Védelem Tudomány, V. évfolyam, 1. szám, 2020. 1. hó. Elérhető: http://www.vedelemtudomany.hu/articles/09-nemet-katai-vass.pdf (Download: 2023-04-12)

Balázs Barina

First response in radiological emergency situations

Abstract

Experience of the past decades shows that the most important participants and first responders in the early stages of radiological emergency situations are the local emergency services, in our field firefighters, and in our country the crew of the facility fire department of the nuclear power plant of Paks. In addition to the general safety tasks of firefighting, it is extremely important to pay special attention to personal safety based on international and national regulations, measurements and the use of special equipment.
Keywords: First responders, first response, radiological hazards, radiation protection

Introduction

The intervention in radiological and chemical accidents is very similar. Both have in common that our senses may, or cannot detect the presence of dangerous substances. Therefore, the primary operations of the intervention must be determined based on other information, such as bars, inscriptions. These indicate the presence of dangerous substances and the need of use of specfic instruments and measuring devices.

The main goals of intervention in radiological emergency situations
To save human lives.
To protect the population and the plant personnel.
To protect the intervention staff during the operations. **To create the possibility of widening the intervention.**
To collect and retain information that may be useful for managing health effects and preventing similar emergency situations.

Table 1 - The main goals of intervention in radiological emergency situations, based on the manual of first responders [1] / edited by the author.

Objective

With my research and the presentation of its results, my goal is to explore the ways of first intervention in radiological emergency situations, to describe its dangers, and to determine methods of intervention that pose the least risk to the interveners and are still effective. Then, with further research on the topic, I will develop appropriate intervention procedures for resolving radiological and chemical damage events with the use of special personal protective equipment and tools used in other areas of firefighting.

Method

For my reaserch I was using secondary research methods which encase:

- Document analysis, extensive study and processing of documents;
- General comparison, generalization, and chronological test method;

- Analytical logic, literature and legal research relevant to international and national level

Findings

The dangers of radiation

International medical literature extensively discusses the harmful effects of ionizing radiation and the consequences of radiation. Ionizing radiation can transfer energy and is not detected by the body (regardless of the degree of exposure). The ionizing effect causes chemical changes, which modifys the functioning of cells, this causes a biological effect in the human body.

Stages of the processes in the body as a result of exposure to radiation:

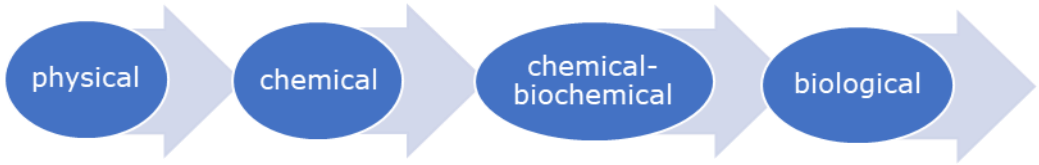


Figure 1 - radiation exposure stages edited by the author [2].

Ionizing radiation can cause radiation injury or radiation sickness. In the case of damage to specific parts of the body, we speak of radiation injury, while in the case of an effect on the entire body, we speak of radiation sickness. Regarding the biological effects of ionizing radiation, they can be classified into two groups: stochastic and deterministic effects. The deterministic effects occurs above the so-called threshold dose, and its severity depends on the absorbed dose. The threshold dose for radiation sickness is 1 Gray [2][3].

Protection of the first responders

The analysis of the radiological emergency situations of the last decades showed that wearing – carrying a dangerous radiation source for a short period of time has serious deterministic health effects. Therefore, everything must be done to avoid possible contact with radioactive materials. Staying close to a radiation source for a limited period of time is less likely to cause deterministic health effects.

The intervention staff can avoid radioactive contamination even if they do not have a suitable radiation detection instrument, but they follow the first responders guidelines:

- avoid objects that can be considered radioactive,
- perform only life-saving operations near radiation sources,
- avoid smoke, or during interventions in smoke, wear your regulated breathing apparatus,
- do not touch your face or mouth with your hands before discharge and dosimetric measurement,
- do not eat, drink or smoke before ablution [4].

Protection against internal radiation exposure:

- Radioactive material can enter the human body through breathing– breathing aparats and protection must be used during the intervention.
- Radioactive material can enter the body by swallowing - food can only be consumed in safe areas after decontamination and proper dosimetrical control.
- Radioactive material can also enter the body through injuries to the skin surface. – use of firefighter protective clothing and protective gloves provide adequate protection. [4].

Protection against radiation exposure from an external radiation source:

- Time protection means working for the shortest possible time near the radiation source. Before the start of the intervention, the dose map created by the dosimetricians can be used to plan the shortest approach route and calculate the maximum working time per person.
- Another example of adequate time protection is if a larger number of interventionists are used for a task to be performed in radiation-hazardous conditions at the same time. Working in appropriate shifts, the working time and dose load per person can be reduced.
- In practice, distance protection means that we try to perform our task as far as possible from a pointlike source of radiation [4].

The rules of first response in serious accidents

In radiation-hazardous areas, intervention and firefighting can only be started if the radiation protection specialist gives permission to do so. Exceptions to this are measures taken to save lives and prevent major material damage, as well as to protect the population, during which the dose load of the interveners must be continuously monitored. With regard to nuclear power plants, the engineer on duty supervises the fire chief in matters concerning nuclear safety.

Overview of the primary intervention

Lifesaving the first task
When saving lives, it must be taken into account that, measures must also be taken to eliminate deterministic effects endangering the population and to reduce the effects of stochastic processes. The rescue of persons in endangered areas must be carried out taking accoarding the properties of the radioactive material, the direction of its spread. The persons to be rescued must be provided with adequate protection and transported to a safe, isolated place, where first aid must be provided. The intervention staff must pay attention to compliance with emergency dose limits.[5]

The liquidation of damages
A The extinguishing procedures, as well as other measures, must be defined in such a way that they comply with the valid instructions and regulations and do not lead to the spread and dispersal of radioactive materials. During the intervention, unjustified radiation exposure and contamination with radioactive material must be avoided [5][6].

The steps of organizing the intervention in a radioactive environment
The approach should be conducted on the least polluted route, according to the scattering and the wind direction
The location of fire engines and vehicles and water sources should be designated outside the danger and the transition zone
The absolutely necessary staff and equipment must be operated for as short as possible
The intervention must be carried out as far as possible from the radiation source
The shielding possibilities provided by buildings and the terrain must be used against radiation
After the intervention, the deployed forces and devices must be decontaminated and measured at the designated area

2. table The steps of organizing the intervention in a radioactive environment based on the manual of first responders and national regulations/ edited by the author

Suggestions

In the extended abstract, I summarized the essence of the research, which briefly presented the harmful effects of radiation on the human body and the ways and possibilities of protection. In the following, I make my recommendations to the accident site commanders for the effective organization for interventions in radioactively contaminated areas.

Recommendations for site commanders:

Selection of the intervention route:	**Based on weather conditions, radioactive emissions and other sources of danger.**
Determination of protective clothing and respiratory protection:	Based on primary information.
Informing the responders about the sources of danger:	Accoarding to the radiation protection rules.
On-site information collection:	Designation of dosimetric, technological, zone boundaries and entry points.
Definition of occupational safety rules:	Radiation conditions and dose limits, maximum deployment times must be defined.
Reconnaissance:	With the perticipation of the operating organizáción, with the involvement of the radiation protection organization and the involvement of the KML units.

Based on the reconnaissance, he determines:	Additional protective clothing, respiratory protection devices. Clarification of deployment time limits must be made.
After the assessment of the damage:	Take measures to alert fireman staff on duty and professional fire units. If necessary, take measures to order the npp's day-off staff to the accident site.
Lifesaving:	It must be carried out in radioactively contaminated conditions.
Rescued persons:	Their dosimetrycal and medical examination and, if necessary, their decontamination must be ensured.
Professional units:	Appoint a briefer to receive the units, designate the meeting place, take measures to supply the first arriving units with MGP dosimeters, if necessary, share the leading of the fire fighting and technical rescue and create reserve.
Intervention:	Prevent the spread of contamination. Enable continuous dosimetric monitoring.
After the intervention:	Decontamination of interveners, registration of the doses suffered must be carryed out.
Evaluation of the intervention:	Evaluation of the efforts made so far, ordering the additional necessary forces and special equipment to the site and the elaboration of activities for the next 24 hours must be calculated.

References

[1] International atomic energy agency: Manual for first responders to a radiological emergency; IAEA Vienna 2006 Sourcehttps://wwwpub.iaea.org/MTCD/Publications/PDF/EPR_FirstResponder_web.pdf (download time: 2022.03.06.)

[2] Barótfi István: Környezettechnika; M. gazda Kiadó, Budapest 2000. 963 9239 50X

[3] Sándor, Damjanovich, Judit, Fidy, János, Szöllősi: Orvosi biofizika; Medicina Könyvkiadó Zrt., Budapest 2007. ISBN: 978 963 226 1270

[4] Varga József, Nagy Annamária: Orvosi - biológiai izotóplaboratóriumok sugárvédelme; Debreceni Egyetem, Debrecen 2011. Source:https://regi.tankonyvtar.hu/hu/tartalom/tamop425/0019_1A_Orvosi-biologiai_izotoplaboratoriumok_sugarvedelme/index.html (download time: 2018.03.20.)

[5] 6/2016. (VI. 24.) BM OKF utasítás a Tűzoltás-taktikai Szabályzat és a Műszaki Mentési Szabályzat kiadásáról.

[6] Antal Zoltán: A Sugárveszélyes területeken keletkezett tüzekoltásának taktikája az Operatív Műveletirányítási felhasználásával Nemzeti Közszolgálati Egyetem Intézet, Budapest 2017. Source: Antal Zoltán/Atomerőmű űzoltóság/2017

Ádám Berger – Lajos Kátai-Urbán - Zsolt Cimer

Principles for the outdoor storage of dangerous goods in parcels

Abstract

Industry, and therefore its development, has a major impact on a country's economy. In the wake of the global crises of recent years, the hitherto popular "Just in Time" principle has been replaced by the importance of stockpiling. Stockpiles include an increasing number and quantity of dangerous substances. These developments have made it timely to review the outdoor storage of dangerous goods in unit loads.
Keywords: industrial safety, dangerous substances, outdoor storage, stock, receiving space

Introduction

Industry plays a key role in a country's national economy through the diversity of its activities and the (close) cohesion between them. Therefore, the development of industrial production has a significant impact on the performance of the economy. Natural factors are of great importance because of the existence of national borders, which are considerably dampened by economic globalisation and international agreements and cooperation. In industrial activities, inventories are a very important part of the economy's material flows, as they ensure the continuity of the plant's operations and the relative independence of the sub-processes. Economic growth and technological development ensure that the growing needs of society are met, and this inevitably leads to an increase in the number of plants dealing with dangerous substances. There are two main ways in which plants can meet the increased demand for raw materials classified as dangerous substances: either by increasing the frequency of deliveries or by setting up new (temporary) storage facilities. The aim of this publication is to present the basic principles for the outdoor storage of dangerous goods in bulk. [1][2]

Objective

The expansion of industry will require the development and expansion of existing plants and the creation of new ones. However, this requires the application of legislation, technical (safety) regulations and standards to protect the population and the environment, and their monitoring by the authorities. For activities involving dangerous substances, in addition to legislation, the town and country planning, safety distances and bunds are of great importance. [3] Recent disasters, both natural and civil, and the diversity of these disasters, show that the last two decades of the 20th century and the first two decades of the 21st century have presented the world with a multitude of challenges. As a result, it is a basic principle that effective protection against disasters can only be ensured if prevention is at the forefront and the organisations and populations responsible for protection are prepared in good time. [4][5]

Methods

When considering the installation factors of a plant, the legal regime should be mentioned, the reason being that international and national legislation essentially determines (among other things) the conditions for the establishment, construction, operation, inspection, closure/termination and the control of major accidents involving dangerous substances. The Hungarian legislation relevant to this publication is the following:

- Act CXXVIII of 2011 on Disaster Management and the Amendment of Certain Related Acts (hereinafter referred to as the Act);
- Government Decree No. 219/2011 (X. 20.) on the protection against major accidents involving dangerous substances;
- Government Decree No. 234/2011 (XI. 10.) on the implementation of Act CXXVIII of 2011 on disaster prevention and amending related acts;
- NGM Decree No. 1/2016 (I. 5.) on the technical safety requirements and official supervision of storage tanks and storage facilities for dangerous liquids or melts;
- Government Decree No. 365/2016 (XI. 29.) on the designation of the Government Office of the Capital of Budapest as the authority in certain industrial and commercial matters, and on the regional metrological and technical safety authorities;
- Government Decree No. 216/2019.(IX. 5.) on the dangerous liquids or melts storage tanks, storage facilities technical-safety authority supervision.

Due to the technical specificity of the industry, it is essential to apply the relevant technical (safety) regulations and international and national standards, of which the following documents are considered to be the most relevant for publication:

- MSZ 9935:1993 Safety requirements for the temporary storage of road transport units carrying dangerous goods (Start of validity: 1994. January 1.);
- MSZ 9936:1993 Safety standards for the transitional-provisional storage of dangerous goods (Start of validity: 1994. February 15.).

The need for and capacity of bunds is addressed in both standards, which must be designed with either recessed or solid walls. In addition, it is an important requirement that bunds must be made of non-combustible materials and be of sufficiently solid and compact design to be impermeable to liquids. [6] In both cases, it is essential that the bunds are equipped with devices for the efficient drainage of the water generated (e.g. fire-fighting water, rainwater), which must be separable and sealable, and must be operable in the event of fire and operable from a protected location. The following criteria shall be taken into account in determining the capacity of the bunds:

a) in case of danger, the liquid in the tanks/containers must not escape from the bund;
b) in the case of a tank, the volume of the bund is the volume of the largest tank (or the largest chamber in the case of a multi-chamber tank);
b) in the case of packagings, the volume of the receptacle is the volume of the largest packaging (3000 litres);
c) 10% of the volume of all tanks/packaging containers placed in the holding space, but not less than the volume of the largest tank/container;
d) the volume of the compartment is the maximum volume resulting from the application of (b) and (c).

The principles for sizing the volume of the enclosures are described above, but in addition to the minimum volume, other geometric aspects should be considered.

It is required that the volume of the bund be such that in the event of damage the stored liquid cannot escape from bund. However, the possibility of "escape" is not only due to the saturation of the bund, but also to the flow over the walls of the bund and the leakage through the base and walls of the bund, and therefore the design of the bund must also be considered.

Findings/Results

If the bund and wall height are undersized, then (depending on the level of the tank) a breach higher up the tank wall may allow the dangerous liquid to flow over the side wall of the bund. If, on the other hand, in the case of a breach in the tank wall, the dangerous liquid flows into the bund and there is a breach in the side wall/floor of the bund, the substance can leak through it. For these reasons, when dimensioning the bund, it is necessary to dimension not only its volume but also its area and the height of its side walls. In addition, safety, usability and durability must also be taken into account when choosing the material for the bund.

Conclusions/Suggestions

As technology and industry evolve, the range of dangerous substances is expanding, and continuous adaptation by the authorities is essential. The industrial incidents that have occurred so far have highlighted the need for continuous review and improvement of the legislative system, as well as of the architectural, building services and safety requirements. This publication describes the need for appropriate geometrical design and efficient construction of outdoor permanent and temporary storage areas in factories. It remains a general principle that a storage area or storage tank should be designed, constructed and operated in such a way that it does not pose a danger to the environment or to the operating personnel during normal operation. In addition, it is also important to ensure that the emergency response teams can perform their tasks safely in the event of an incident.

References

[1] Kovács, Zoltán; Pató Gáborné Szűcs, Beáta (2007) "Raktározás", Budapest: Nemzeti Szakképzési és Felnőttképzési Intézet, 120 p.

[2] Berger, Ádám (2021) „A veszélyesanyag-tárolótartályok tervezésének iparbiztonsági aspektusai” Hadmérnök, 16 : 3, pp. 81-96., 16 p.

[3] Cimer, Zsolt; Kátai-Urbán, Lajos; Vass, Gyula (2020) „Katasztrófa-kockázatok,a településrendezési tervezés szerepe a megelőzésben,” in Katasztrófák, kockázatok, önkéntesek, Hábermayer, Tamás szerk., Szekszárd, Tolna Megyei Katasztrófavédelmi Igazgatóság, pp. 56-63.

[4] Hábermayer, Tamás (2022) „Veszélyforrások és környezetünk biztonsága - generációs konfliktusok és a segítségnyújtás,” in „Katasztrófák és következmények, segítők és áldozatok”, Hábermayer, Tamás; Varga, István; Ackermann, Zsuzsanna szerk., Szekszárd, Tolna Megyei Katasztrófavédelmi Igazgatóság, pp. 24-35.

[5] Nagy, Rudolf (2023) „A munkahelyi kémiai ártalmak és az iparbiztonság”, Polgári Védelmi Szemle XV pp. 261-279. 19 p.

[6] Lublóy, Éva Eszter; Varga, Ferenc (2021) „Non-destructive material testing possibilities of reinforced concrete structures after a fire”, Védelem Tudomány: Katasztrófavédelmi Online Tudományos Folyóirat 6 : 3, pp. 53-79. 27 p.

Standards

MSZ 9935:1993 Safety requirements for the temporary storage of road transport units carrying dangerous goods

MSZ 9936:1993 Safety standards for the transitional-provisional storage of dangerous goods

István Benda - József Dobor

Summary of the lithium battery issue from the perspective of first responders

Abstract

Lithium batteries as energy storage units are becoming more widespread these days due to certain trends such as renewable energy, climate protection etc; Lithium batteries are currently one of the best options for storing renewable energy as they have excellent attributions. Because it can be produced in almost any size and used almost anywhere. But lithium batteries carry dangers, such as their fires burning with intense heat and generating significant amounts of combustion gases and fumes. These fumes and gases contain large quantities of explosion hazardous and toxic gases, these gases are very dangerous especially in quantities and confined spaces. High temperatures can put a strain on the primary intervention units and the buildings where these damage is taking place. Fire departments must be prepared for accidents and dangers where lithium batteries will be involved. The purpose of my present work is to draw attention to problems in the field that may arise during lawsuits. In the world, including Hungary, we are not prepared for the spread of lithium batteries and their expiring problems, as lithium batteries gained ground in our lives sooner than we firefighters would have been able to develop appropriate prevention interventions. To this end, I consider it important to look for potential sources of danger, weak links, and to prepare in time for regulators, with the right tools, the right opportunities, and trained personnel to intervene as quickly and safely as possible in the event of damage to lithium batteries.
Keywords: lithium battery, alkaline metal fire incidents, first responder

Introduction

I set myself the challenge to gain and pass on additional knowledge to my comrades and those who are also interested in the problems caused by lithium batteries. I also want to make people aware of the dangers of intervening at such damage sites.

Objective

That is why it is important to learn and understand, through the incidents that have taken place, and I am thinking here of "incidents both at home and abroad", what impact these incidents have had on the firefighters who have been involved in the first intervention, and what experience they have gained. Or what impact they have had on buildings, how they can be compared to similar incidents where lithium batteries were not present. Their experiences were: high temperatures, extremely high levels of combustion products, prolonged interventions. The effects of these experiences will be illustrated to the reader through case studies.

Method

Case studies are an important part of our work. In addition, we show the processes that take place based on physical and chemical changes.
In Austria, the A4 and A2 motorways are connected from the south by the S21 motorway, part of which runs in a tunnel under the Austrian capital Vienna. It was in the tunnel of this motorway that a fire occurred when the tyre of a tractor-trailer truck first caught fire. When the driver noticed the fire, he stopped the vehicle in the tunnel and tried to extinguish the burning tyre, but unfortunately his efforts were unsuccessful and the relatively small initial fire spread to the entire vehicle assembly within moments.
I would like to use the following example to illustrate the process that starts immediately and to prove to the readers that unpredictability can be formulated in this case as well.On 01.10.2013, on the highway in the city of Kent in the United States of America, an electrically powered car was driving on the highway and drove through what the driver thought was an "innocent" piece of iron. The "seemingly harmless piece of iron" ruptured a battery mounted in the car's floor plate, causing a mechanical failure that resulted in a short circuit, which escalated into a fire. The on-board computer alerted the occupants and asked the driver to pull over and exit the vehicle. Due to the size of the vehicle, the fire spread within moments throughout the vehicle, which was therefore destroyed. The firefighters who attended the scene reported that the fire had been extinguished over several hours, that large quantities of extinguishing water were required and that a large quantity of combustion products had been produced. This can be attributed to the fact that lithium batteries can burn without external oxygen (oxygen from the air).

Findings

First responders need to be familiar with the risks associated with the new technology that these technologies bring. I am thinking in particular of the immediate and long-term effects of toxic substances and the importance of the use of respirators. I also feel it necessary to mention the great risk that combustion can easily produce combustion products which, under certain circumstances, can cause an explosion. In the course of this training, it could be very useful to study incidents such as the Arizona and Chinese cases to reduce the risks.
The technical rescue of electric vehicles cannot be compared to that of current vehicles, as much more attention needs to be paid to how the intervention is carried out, as one wrong move can easily cause mechanical damage to the battery, which could lead to a fire later on. If, during a technical rescue, the vehicle is on its side due to an accident, then particular attention must be paid to the correct way of supporting it, as these vehicles have a different centre of gravity.

Conclusion

Over the past centuries, there have been global changes in population growth and energy use, with the result that our immediate environment has suffered severe damage. Environmental protection has become a priority for our society.
As a result of the above, renewable energies and the storage units in which we can store the electricity generated from renewable energy until it is used have become widespread. Their deployment is being promoted in all countries to reduce the negative impact of climate change. There are currently many storage units in the world, but their use is not always possible everywhere. One exception is the

lithium battery. Lithium batteries have become popular for renewable energy storage because of their favourable properties. However, this energy storage unit is considered to be young, as its first prototype was developed in the 1970s.
For all new technologies, including lithium batteries, problems and hazards can arise during their development, which can arise in unexpected situations (fires, technical rescue, etc.) These initial problems have also been faced by firefighters carrying out first intervention, and in many cases these problems have presented them with challenges, such as: extreme high temperatures, corrosive and toxic fumes, and prolonged interventions.

References

[1] Fire and Emergency New Zealand Research Report Number 174 ISBN Number 978-1-92-728737-8, ISSN Number 2703-1705 © Copyright Fire and Emergency New Zealand, https://www.fireandemergency.nz/assets/Documents/Files/Report_174_Lithium_Batteries_Whats_the_problem.pdf

[2] JRC exploratory research: Safer Li-ion batteries by preventing thermal propagation Workshop report: summary & outcomes (JRC Petten, Netherlands, 8-9 March 2018, Vanesa Ruiz and Andreas Pfrang, EUR 29384 EN 2018, ISBN 978-92-79-96399-5 ISSN 1831-9424 doi:10.2760/096975, https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113320/kjna29384enn.pdf

[3] DNV GL. (2019). Live Fire Test of Tesla Powerwalls. DNV GL Doc. No.: 10075610-HOU-R-01-D 4 March 2019

[4] ESNZ. (2019). 170327-02-3100606182 - Battery finding_Release. Energy Safety New Zealand, Official Information Release. 15 July 2019

[5] FAA. (2019). LITHIUM BATTERIES & LITHIUM BATTERY-POWERED DEVICES, Events Involving Smoke, Fire, Extreme Heat or Explosion Involving Lithium Batteries. Retrieved from https://www.faa.gov/hazmat/resources/lithium_batteries/media/ Battery_incident_chart.pdf 15/9/2019

[6] Fogelman, Ryan. (2017) Are Lithium-Ion Batteries Causing A Fire Epidemic In The Waste & Recycling Industry? Retrieved from https://www.linkedin.com/pulse/

waste-recycling-industry-facing-fire-epidemic-ryan-fogelman/

[7] Hattrem, Hanne. (2016), Tesla fire: Short circuit in the car, but don't know why.https://www.vg.no/forbruker/bil-baat-og-motor/i/xnnmX/tesla-

brannen-kortslutning-i-bilen-men-vet-ikke-hvorfor 17/9/2019

[8] King, Danny. (2016), Tesla fire in France was caused by bad electrical connection. https://www.autoblog.com/2016/09/13/tesla-fire-france-caused-by-bad-electrical-connection/ 17/9/2019

[9] Klock, Andrew. (2019). Arizona explosion underscores potential hazards posed by ESS technology, and the need for more responder education. Retrieved from https://community.nfpa.org/community/nfpa-today/blog/2019/04/22/arizona-explosion-underscores-potential-hazards-posed-by-ess-technology-and-the-need-for-more-responder-education 18/9/2019

Alexander Fekete – Manuel Geiger – Steffen Neuner – Muhammed Enes Bodur

Challenges in adaptation/modification of the German incident command system for hospital disaster management

Abstract

Hospitals are an existential part of the health system in Germany. In case of an incident, hospitals are both an essential, but at the same time vulnerable infrastructure and therefore need to be treated by the government and their own management with special attention. It is important to analyse the readiness of hospitals and emergency services also within a larger context of disaster management since a failing hospital will place a huge burden not only on the health system but also on fire brigades and other organizations. This must be addressed in the prevention and preparation of disasters as well as in response to disasters. Hospitals can face multiple problems in case of an incident. For example, the patient influx is increasing strongly compared to normal operations. On the other hand, patient treatment can be influenced by failing supply infrastructures, such as water, electricity, or roads and helicopter accessibility. To respond to incidents, hospitals have to change their operational structure into a more flexible and adapted incident command system (Incident command system 100). In Germany, the most common ICS used by emergency services is described in the fire service regulation 100 (Feuerwehr Dienstvorschrift 100), which is also recommended for usage in hospital contexts (FeuerwehrDienstvorschrift 100 (FwDV 100) "Führung und Leitung im Einsatz - Führungssystem -" of 1999).
Keywords: Incident command system, hospital, Germany, disaster, hazard, prevention

Objective

Hospital incident management planning is established in Germany to further strengthen preparedness and coping mechanisms (Kowalzik et al. November 2020). An important part of hospital incident management is the hospital incident management team (HIMT), as it is responsible for the execution of the plan and adapting to changing environments. In the USA, a custom-made hospital incident command system (HICS) was derived from the ICS used by emergency services (Ballay 2014). The ICS used in emergency services in Germany is not completely adapted and modified for hospitals. Different incident management approaches are needed as hospitals and emergency services face different problems and tasks in incident response. As smaller hospitals are limited in their personal resources, a scalable solution is needed for HICS. Therefore, recommendations for a more suitable adaptation of the ICS for hospitals need to be developed.

Method

The process of adaptation of the ICS was conducted in four steps. First of all, multiple ICS, national and international, were identified and substantially evaluated through literature analysis. Secondly, the needs of hospitals have been collected in expert interviews and an online survey with other partners of a project called NOWATER (BBK 2023; *NOWATER* 2023). In a third step, key findings were

used to modify the German ICS, considering the needs of hospitals. Lastly, the results were presented to an expert audience, and feedback was incorporated.

Findings/results

In the literature research, the US-American HICS was identified as most suited to derive adaptations of a nationwide used ICS into hospital contexts because of its high standardisation and standard operational procedures (SOP). Interview partners rated official recommendations as unsuitable for smaller hospitals because of scarce staff resources (Kowalzik et al. November 2020). The online survey underlines those statements as presented in Fig. 1. It shows that only half of participating hospitals (n=72) use the officially recommended HICS.

Conclusion/suggestions

As emergency services focus on deploying responders, their ICS is focused on tactics and operations, especially managing additionally dispatched standardised units proceeding with their original task. In hospital contexts, the HICS is focused on managing usual staff to fulfil extraordinary and additional tasks. Another difference between emergency services and hospitals is that emergency services can deploy nearly unlimited additional units from different areas, if necessary, which is only limitedly possible in hospitals. Besides those differences, another key finding is that the standardised HICS will probably not work for all German hospitals because there are differences in location, medical treatment options, and administrative as well as financial limitations. Apart from this, we suggest integrating members of the legal affairs department, institute of hospital hygiene, as well as health and safety department into the hospital incident management team. Analysing ICS between different countries can help to improve the national ICS, and a cross-country comparison with other countries, such as Hungary, would be helpful for both science and practice.

References

[1] (2023). NOWATER. Available online at https://www.th-koeln.de/anlagen-energie-undmaschinensysteme/nowater_75267.php (accessed 4/17/2023).

[2] Ballay, Catherine (2014). Hospital Incident Command System guidebook. 5th ed.

[3] California Emergency Medical Services Authority.

[4] BBK (2023). NOWATER. Available online at https://www.bbk.bund.de/DE/Themen/Kritische-Infrastrukturen/KRITIS-Projekte/NOWATER/nowater_node.html (accessed 4/17/2023).

[5] Feuerwehr-Dienstvorschrift 100 (FwDV 100) "Führung und Leitung im Einsatz - Führungssystem -" of 1999. Incident command system 100.

[6] Kowalzik, Barbara/Hähn, Frank/Helmerichs, Jutta (2020). Handbuch Krankenhausalarm- und einsatzplanung (KAEP). Empfehlungen für die Praxis zur Erstellung eines individuellen Krankenhausalarm- und einsatzplans. 2020th ed. Bonn, Bundesamt für Bevölkerungsschutz und Katastrophenhilfe.

Tamás Hábermayer – Árpád Muhoray

The activity of urban search and rescue teams and the relationship between asbestos pollution. The Alert Pro 1000 and the WISER software

Introduction

In case of a big natural disaster – especially earthquakes, when a lot of buildings are damaged - asbestos containing materials can came out from the walls and pipes and can lead to asbestos exposure among first responders, clean-up crews and nearby residents. If there is no sufficient protections against it, inhaling these fibres can lead to serious disease years later. When someone is exposed to asbestos, there will be an increasing risk of developing asbestos-related diseases such as mesothelioma.In order to evade the harmful consequences, there are special softwares such WISER that can help to identify the dangerous materials and gives instructions, what to do with it. There may be a connection between the activities of urban search and rescue teams and the asbestos contamination of disasters involving massive building destruction.Due to the consequences of the earthquake disasters in Turkey, the European Union and the UN have published a special call to draw attention to the danger. All rescue teams must pay extra attention to the safety of their own personnel, and therefore must review their action plans, safety plans, and equipment for effective protection.
Keywords: USAR, asbestos, pollution, disaster

Objective/Methods

- research of scientific materials,
- analyse the possible equipment for measuring and immediatly alerting in case of asbestos,
- investigation of internal and international regulation of EU, UN, HUN,
- collection of knowledge of operations of disaster management,
- comparing the safety standards of external and internal, foreigner and home level,
- gain experiences of planning of managing work, of civil protection, firefighters and industrial safety.

Asbestos pollution

The link between asbestos and natural disasters:

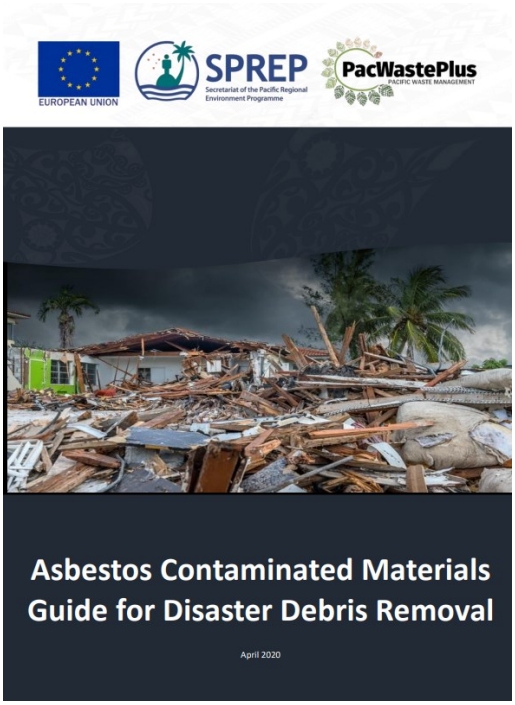
- forest fire,
- hurricane,
- tornado,
- earthquake,
- during a flood,

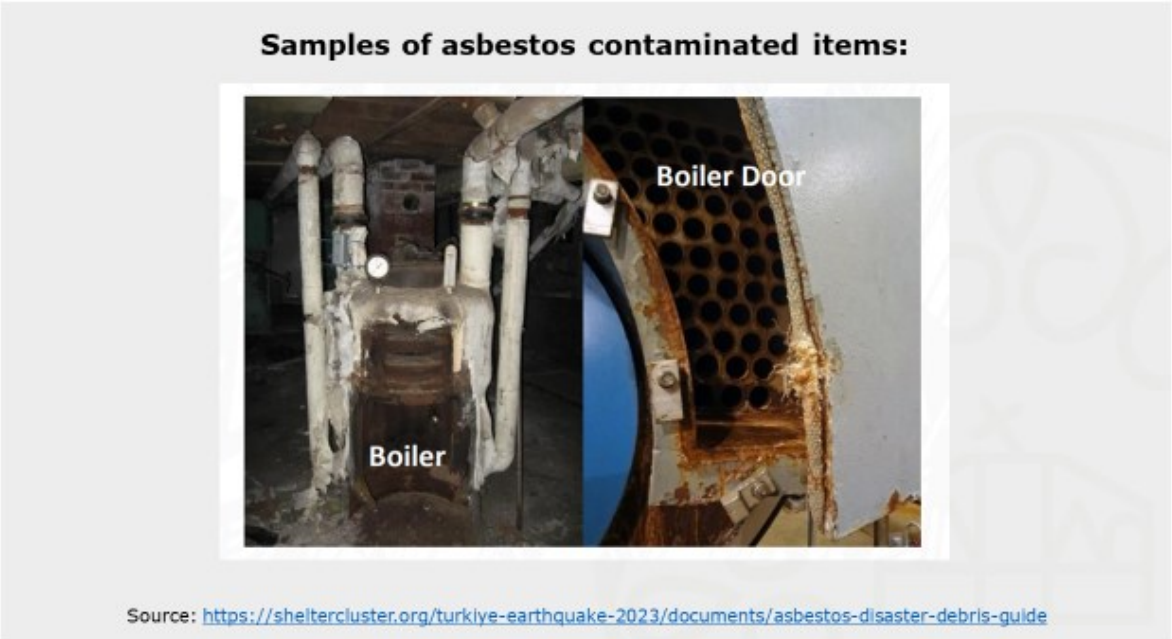
pollution can occur due to the deterioration of buildings.

From the 1980s to almost the present day, asbestos was used in some countries and incorporated as an insulating material in buildings. Until then, the hazardous substance does not cause pollution, as long as the property is in good condition, covered with plaster or other materials. However, if the building is damaged, asbestos can be exposed to the surface in the form of microscopic dust.

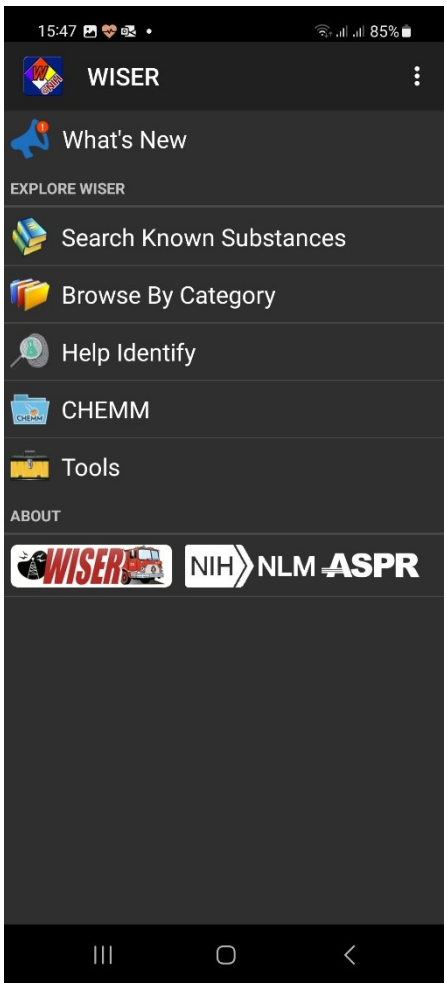
Methodological guide: Recognizing asbestos-contaminated materials in damage following disasters

https://shelltercluster.org/turkiye-earthquake-2023/documents/asbestos-disaster-debris-guide





Possible detection system: Alert Pro 1000, and tactical identifications software: WISER.



Findings

Examining the guidelines, methodological guidelines and directives issued by the European Union and the UN, it became clear that the issue of asbestos pollution must be dealt with. It is necessary to defend against the dangerous effect, for which the opportunity provided by modern technology, software and technical devices must be used, so that the intervening staff and the population in trouble can be protected. The asbestos pollution can seriously endanger the health of the citizens and the urban search and rescue team members.

Conclusions / suggestions

Recommendations for the protection of urban search and rescue teams:

In order to their own stock not to be exposed to possible pollution, they must take the following steps:

- even by purchasing equipment out of line, achieve that they have a device among their equipment that can be used to detect damage in the area the presence of asbestos and other harmful dusts

- after that, the intervention procedures must be reviewed and modified for the sake of safety - the persons with emergency reconnaissance positions must be specially prepared for the reconnaissance task
- the purchase and ordering of the use of personal protective equipment out of sequence may become necessary, if there is a suspicion of contamination
- upon completion of the missions, measures must be taken to check the equipment and, if necessary, to examine the personnel.

References

[1] Asbestos disaster debris guide (EU, SPREP, PACWASTEPLUS) https://shelltercluster.org/turkiye-earthquake-2023/documents/asbestos-disaster-debris-guide Downloaded: 04/04/2023.

[2] INSARAG website – Guidelines. https://www.insarag.org Downloaded: 04/04/2023

[3] Wiser official webpage: https://www.nlm.nih.gov/wiser/index.html Downloaded: 04/04/2023

[4] Alert Technology official website https://alerttechnologyltd.com/the-alert-pro-1000/ Downloaded: 07/04/2023

[5] American Lung Association https://www.lung.org/clean-air/at-home/indoor-air-pollutants/asbestos Downloaded: 07/04/2023

[6] Significance of Environmental Asbestos on Air Pollution in the Eastern Mediterranean Region https://apps.who.int/iris/bitstream/handle/10665/119623/dsa1208.pdf?sequence=1 Downloaded: 08/04/2023

[7] Asbestos and Natural Disasters Guide https://www.asbestos.com/asbestos/natural-disasters/ Downloaded: 08/04/2023

Maxim Kátai - Urbán - Tibor Bíró - Róbert Révai - Zsolt Cimer

Safety Organization of Dangerous Establishments, with particular regard to the Prevention of Water Pollution

Abstract

Major accidents involving the release of dangerous substances in dangerous establishments can cause significant environmental damage if contaminated firewater enters into surface water, groundwater or the soil.[9] The topic of this study focuses on the research of the border areas of environmental protection, water protection and industrial safety, in which the common research field is accidental water pollution prevention. In this study, the authors examine the technical competencies associated with industrial safety responsibilities, with particular regard to the prevention of accidental water pollution in dangerous establishments.
Keywords: Industrial accidents, environmental impact, dangerous establishment, firewater pollution prevention, Hungary

Introduction

Major accidents involving dangerous substances endanger human health and the environment. Due to major industrial accidents the contaminated firewater can cause significant environmental consequences.[10]
On the one hand the basis of the operation of industrial safety regulation and the institutional system is the fulfilment of the operator's obligations and its industrial safety authority task.[11] [12] On the other hand the basis for the operation of the system is the development of the relevant technical procedures and methodology. [13] This activity could be carried out effectively through a harmonized and uniform application of the law, which is conditional on the development of an appropriate set of tools.[14]
The emergency and preventive fire protection situation of dangerous establishments must be taken into account when examining this topic [15] In addition to hazardous substances, the environmental effects of hazardous waste must also be taken into account [16]
In the following we will provide information about the relevant requirements of industrial safety legislation related to the prevention of water pollution.

Objective

In the present study, the authors examine the requirements of the Hungarian disaster management, environmental protection and water quality protection regulations applied for the prevention of the environmental effects of industrial accidents.

[9] Kátai-Urbán (2022)
[10] Hybská - Makovická Osvaldová - Horvathová - Hýrošová - Restás (2022):
[11] Szakál - Cimer (2014)
[12] Cimer – Varga (2015)
[13] Nagy (2023)
[14] Érces – Vass - Ambrusz (2023).
[15] Restás – Pántya – Rácz - Érces – Hesz - Bodnár (2018)
[16] Morvai - Révai (2016)

Methods

Analysis and evaluation of international and domestic legal regulations on industrial safety and related scientific literature.
Examination industrial safety's law enforcement experience of operators and industrial and water safety authorities
Professional consultation on the researched topic with domestic and foreign experts recognized in both professional and scientific circles.

Results

1. The introduction of fire water collection and storage measures is based on the Fire Protection Concept of the given facility, which defines the design and implementation of the operator's safety system. The UNECE Guide[17] provides a procedure for calculating the amount of extinguishing water that can be used. For the design and construction of a system for the collection, installation and use of contaminated fire water, the UNECE Guide recommends the use of the German VdS 2557 Guide[18] and the Swiss Guide[19]. It is also recommended that operators use the UNECE JEG model to be used as a technical procedure for calculating the amount of contaminated extinguishing water in existing installations. [20]
2. The regulations on major accidents, fire prevention, water quality prevention and environmental protection apply to logistics warehouses storing dangerous substances and goods. The specific accident regulations for dangerous substances do not contain a specific provision on the capture of contaminated extinguishing water. The precondition for the logistical storage of dangerous substances and goods must be the environmental impact assessment procedure, one of the essential parts of which is the determination of the retention and trapping capacity of fire-fighting water. Fire prevention regulations do not currently regulate fire water pollution prevention requirements.
3. It can be stated that there is a need for regulation in connection with the storage of dangerous substances and goods. Therefore, it is recommended that the requirements for extinguishing water collection spaces and equipment discussed in detail in Hungary in the form of a Fire Protection Technical Directive, which is already well-proven by German regulations.
4. Existing logistics warehouses for the storage of dangerous substances and goods may be significantly involved in the prevention of fire water pollution. In the case of the already operating logistics warehouses, in order to prevent the environmental effects caused by possible major accidents and fire water pollution, it is proposed to identify these sites and develop the control criteria of risk analysis and safety documentation. [21]

[17] UN Economic Commission for Europe (2019)
[18] VdS 2557.
[19] Kanton St. Gallen Amt für Umwelt (2017)
[20] Bíró – Hoffmann - Kátai-Urbán (2019).
[21] Kátai-Urbán (2022)

Conclusions/suggestions

1. Major accident regulations deal with the mitigation measures only in a general way, where there is no specific provision for the retention of contaminated firewater.
2. It can be stated that the majority of accidents involving a release of a dangerous substance and requiring intervention in the field of disaster management are in most cases fire events, which could have a dangerous impact not only on the air but also on the surface and groundwater.
3. In the form of quality requirements in the major-accidents regulation, there are only qualitative requirements for the acceptability of the risk of major accidents involving environmental damages.
4. One of the decisive bases for the installation and usage of dangerous goods storage facilities – from the point of view of disaster management – is the fire prevention concept. The amount of firewater and extinguishing agent is determined by the efficiency of the fire alarm system, the type of fire extinguishing equipment installed, and the amount of firewater used.
5. The National Fire Protection Regulations does not yet have an industrial and logistics chapter dealing with the handling and storing of dangerous substances or goods.
6. In the field of prevention and remediation of environmental impacts on water quality, the preparation and application of operators remediation plans based on the Environment Remediation Decree have a decisive role.
7. Investigation of pollution issues with firewater is not currently addressed by water protection authorities due to the lack of enforceability of a specific legal requirement.
8. The main lesson is that most of the dangerous establishments are prepared for the release and localisation of small amounts of dangerous substances. In storage warehousing facilities, the floor itself serves as a remediation tool. The amount of firewater is unfortunately not quantified.[22]

References

[1] Bíró, Tibor ; Hoffmann, Imre ; Kátai-Urbán, Maxim 2019. Oltóvíz felfogó és tároló létesítmények tervezése és létesítése német útmutató alapján. *Hadmérnök* 14 : 2 (2019) 111-122.

[2] Cimer, Zsolt ; Varga, Ferenc (2015): Application of Special Risk Reduction Protective Measures in Combiterminals for Dangerous Goods. *Academic and Applied Research iIn Military and Public Management Science* 14 : 2 (2015) 209-218.

[3] Érces, Gergő -"Vass, Gyula -"Ambrusz, József: Épületek károsító hatásokkal szembeni rezilienciájának jellemzői. *Polgári Védelmi Szemle* 15 : DAREnet projekt Különszám (2023) 117-130.

[4] Helena, Hybská –; Linda, Makovická Osvaldová – Michaela, Horvathová –; Tatiana, Hýrošová – Ágoston, Restás (2022): Firewater toxicity after extinguishing natural-based insulation materials. *Bioresources* 17 : 2 . (2022) 1988-2002.

[22] Kátai-Urbán (2022a)

[5] Kanton St. Gallen Amt für Umwelt (2017): *Beurteilungshilfe zur Löschwasser-Rückhaltung.* St. Gallen. Online: https://www.zh.ch/content/dam/zhweb/bilder-dokumente/themen/umwelt-tiere/umweltschutz/betrieblicher-umweltschutz/fachbereiche/leitfaden_loeschwasserrueckhaltung

[6] Kátai-Urbán Maxim (2022): Veszélyes anyagok és áruk tárolásának biztonsága, különös tekintettel a baleseti vízszennyezésre. Budapest, NKE Online: https://tudasportal.uni-nke.hu/xmlui/handle/20.500.12944/18645

[7] Kátai-Urbán, Maxim (2022a): Examination of the Firewater Pollution Prevention Regulation in Hungary. *Hadmérnök* 17 : 1 (2022) 57-66.

[8] Morvai, Cintia ; Révai, Róbert . (2016): A hulladékgazdálkodás feladatkörének bemutatása, rendeltetésének katasztrófavédelmi aspektusai. Bolyai Szemle 25 : 3 (2016) 96-103.

[9] Nagy, Rudolf (2023): A munkahelyi kémiai ártalmak és az iparbiztonság. *Polgári Védelmi Szemle* XV Paper: 19 , (2023) 261-279.

[10] Restás, Ágoston ; Pántya, Péter ; Rácz, Sándor ; Érces, Gergő ; Hesz, József ; Bodnár, László (2018): A megelőző és mentő tűzvédelem valamint az iparbiztonság kapcsolódásai. In: Vass, Gyula; Kovács, Gábor - Dobor, József; Horváth, Hermina (szerk.) Katasztrófavédelem 2018: Veszélyes tevékenységek biztonsága. Budapest: BM OKF (2018) 347 p. pp. 340-340.

[11] Szakál, Béla – Cimer, Zsolt (2014): Major Disaster Recovery Plans. *The Science for Population Protection,* 6 (1) , 1–7.

[12] UN Economic Commission for Europe (2019): *Safety Guidelines and Good Practices for the Management and Retention of Firefighting Water.* Geneva: United Nations. Online: www.unece.org/fileadmin/DAM/env/documents/2019/TEIA/Publication/1914406E_web_high_res.pdf

[13] *VdS 2557. Planning and Installation of Facilities for Retention of Extinguishing Water* (2013). Guidelines for Loss Prevention by the German Insurers, VdS Schadenverhütung GmbH., Koln, Germany, Online: https://shop.vds.de/publikation/vds-2557en (download: 2022.10.05.)

Levente Zoltán Lőrincz - Horváth Hermina

Household poisoning accidents and prevention

Abstract

The number of accidents occurring in households is very high in all developed countries, in Hungary there are at least a quarter of a million accidents at home every year. Preventing household accidents, thinking through and avoiding dangerous situations is an important task for all of us. Household accidents and injuries take countless forms, such as falls, falls, cuts, burns, electric shocks, poisoning. Almost anything can be a source of danger, such as a cleaning agent, a medicine box, an electrical outlet or even a simple knife and match. Most household accidents can be prevented with a little care. This information primarily invites the reader to the possibilities of preventing accidental poisoning accidents occurring in households. Our everyday lives are accompanied by countless toxic substances, which we are often unaware of. A poison is any substance that temporarily, permanently or permanently disrupts life processes in sufficient quantities and for a sufficient period of time, thus causing damage, illness, or even death.
Keywords: household accidents, poisoning, prevention, dangerous, chemicals

Introduction

Poisoning occurs when a toxin that enters the body in different ways (through the mouth, through the skin, through the respiratory tract, absorbed through the mucous membrane, or even through breast milk) causes local or general effects, or even both. Among the local effects, the most common symptoms are skin irritation, corrosive, burning sensation, increased mucus production, cough, nausea, vomiting. General effects can also have many variations. Common symptoms are nausea, vomiting, abdominal pain, diarrhea, headache, dizziness, confusion, breathing problems, movement disorders, drowsiness or agitation. The development of poisoning symptoms is influenced by several factors, to a significant extent the type of poison and the characteristics of the body (gender, age, state of health, individual predisposition). We speak of acute (or acute) poisoning when the organism has been in contact with the toxic substance once or only for a short time and as a result, poisoning develops in its body. Chronic (or chronic) poisoning can develop during long-term, continuous or repeated contact with the poison. Here, the symptoms do not appear immediately or with every contact with the substance, the organism becomes ill gradually or after a long latent period. Chronic poisoning most often develops when toxins that affect the body accumulate in the body, such as lead and mercury. In our publication, we present the hazardous substances found in households and the possibilities of protection against them. [1]

Causes of poisoning and their symptoms

In households, poisoning often occurs during the use of medicines, dishwashing, washing, cleaning, bleaching agents, cosmetics, various chemicals (chemicals used for DIY, photography, plant protection, car care products, gasoline, antifreeze), alcohol, tobacco products, toxic room and by eating garden plants, poisonous mushrooms, by inhaling toxic gases (carbon monoxide, chlorine gas, exhaust gas).

[2] Detergents and dishwashing detergents: general cleaning agents. It usually contain anionic and/or nonionic detergents (detergents) as well as enzymes, fragrances, and water softeners. They can be irritating and can cause diarrhea if swallowed. The main source of danger may be the increased foaming of the products. Foams entering the trachea and lungs can cause respiratory insufficiency and suffocation. Washing gel capsules and washing pads contain concentrated, intensive cleaning ingredients, the symptoms caused by them are also more serious. Coughing and vomiting may occur if the gel is splashed into the eyes, nose, or throat or swallowed. Stain removers typically contain hydrogen peroxide, percarbonates or carbonates, which are caustic. If swallowed, they may irritate the mucous membrane, cause burns, and in more severe cases, vomiting may occur. The active ingredients of bleaching and disinfecting agents are mostly sodium hypochlorite, sodium hydroxide, and hydrogen peroxide, which are irritants that cause nausea and vomiting.

Scale removers, drain cleaners, degreasers: In the household, we use several corrosive cleaning agents and chemicals, such as scale removers and descalers, which contain hydrochloric acid, phosphoric acid or other acids in quantities that can cause burns if they get on the skin or mucous membranes. Our alkaline caustic cleaners, e.g. individual dishwasher tablets, drain cleaners, cold degreasers, oven and grill cleaners, which contain sodium or potassium hydroxide or alkali or cationic detergents, which can cause serious burns on the skin or mucous membranes. Toxic gases: Highly toxic chlorine gas is produced when hypochlorite and acid cleaners are mixed together. Chlorine gas has a pungent smell and corrodes the mucous membrane of the eyes, nose and respiratory tract. Inhalation can cause permanent health damage or even death. Gas with a pungent smell, stings the eyes, Carbon monoxide (CO) is produced during the incomplete combustion of natural gas, and can easily lead to suffocation if inhaled over a long period of time. There is a possibility of carbon monoxide poisoning in apartments that are heated with stoves or older types of boilers or convectors. Poisoning is initially characterized by dizziness, headache, tinnitus, nausea, dizziness, confusion, and reddening of the skin. Later, muscle spasms, vomiting, paralysis, then unconsciousness and suffocation occur.

Nail polish remover, perfume, after-shave: Nail polish remover may contain acetone, ethyl acetate and other solvents, which, when absorbed from the stomach and mucous membrane, can cause local irritation, vomiting, central nervous system disorders, and in severe cases can be fatal due to respiratory and circulatory failure. Ethyl acetate also irritates, causes dizziness, lethargy, and general malaise. Perfume and after-shave products contain alcohol, consuming them in large quantities causes typical symptoms of alcohol poisoning.

Insect and rodent repellents are sold in the form of powder, liquid, spray, and granules. Since many types are commercially available, it is not possible to summarize the symptoms and effects of poisoning caused by them. Virtually all kinds of local (tear, redness, runny nose, etc.) and general (nausea, vomiting, pain, cramps, etc.) symptoms may occur. There are also very toxic products among them.[3]

The purpose of using plant protection product is to destroy various plant-damaging organisms (insects, fungi, bacteria, etc.). There are countless types available, so their symptoms and effects can be very diverse. However, most of them are serious poisons. Antifreeze liquid (glycol) is also classified as a poison. When it enters the alimentary canal, it causes symptoms similar to drunkenness, in more

severe cases, nausea, convulsions, and loss of consciousness develop. Unfortunately, its fatal poisoning is also known. In the case of suspected poisoning caused by mushrooms or poisonous plants, the symptoms differ depending on the type of mushroom or plant eaten, as well as the different plant parts. The most typical symptoms are sweating, salivation and runny nose, vomiting, diarrhea, abdominal cramps, muscle spasms, possibly hallucinations, restlessness, drop in blood pressure, fainting.[1]

Conclusion

In our home we can find several dangerous chemicals, for example the corrosive cleansers such as oven cleaner, acid-based toilet bowl cleansers, and of course drain cleaners. After using these products, these aggressive chemicals can cause severe burns, both external, as on the skin or eyes, and internal, burning even the esophagus, stomach, and intestines.

We might think that we're safer with more common cleansers like bleach or ammonia, but both of these can still be punishing irritants. Not only that, but for children, the elderly, and anyone with asthma or heart or lung diseases, bleach or ammonia can cause extreme and severe reactions. Additionally, bleach and ammonia, if combined, can produce highly toxic fumes. These toxic household cleaning chemicals can really be risky in your home.

Many fragrances that are found in cleaning products and odor eliminators – especially those used in laundry detergents, fabric softeners, and fabric sprays – can cause allergic or even toxic reactions. Companies often claim that their chemical makeups are trade secrets to avoid divulging the specific harmful chemicals and allergens in their products.

Immediate reactions to direct exposure are only one form of danger, however. Far more treacherous is that many cleansers have chemicals in them that are known carcinogens or can have neurological or hormonal consequences after prolonged contact. Avoid any product that has diethanolamine (DEA), triethanolamine (TEA),1,4-dioxane, or butyl cellosolve in it. Again – many products that contain those potentially lethal chemicals don't even list them, so do your research.[4]

Since it's difficult to find out the specific chemical makeup of any product, so the best bet is to only use an EPA-registered, cleaner that you can be sure is non-harmful. True cleanliness isn't just about a home that appears to be safe and clean. It's about making sure that everyone that lives there, or even just comes to visit, is protected from harm.

The good news is that Nok-Out odor eliminator or SNiPER disinfectant and odor eliminator don't leave toxic residues behind. Fragrance-free SNiPER enjoys the lowest toxicity rating that the EPA gives out in all four categories (skin, eyes, lungs and if ingested). SNiPER works to kill bacteria, viruses, mildew and other microbes that cause illness and infection, but will not cause you or your family harm.[4]

References

[1] Kormányhivatal: https://www.kormanyhivatal.hu/download/a/d5/e4000/Tájékoztatás%20a%20háztartási%20mérgezéses%20balesetekről.pdf

[2] Rosaura de Farias Presgrave, Luiz Antônio Bastos Camacho, Maria Helena Simões Villas Boas: A profi le of unintentional poisoning caused by household cleaning products, disinfectants and pesticides, ARTIGO ARTICLE2901, Cad. Saúde Pública, Rio de Janeiro, 24(12):2901-2908, dez, 2008.

[3] Replace your toxic household chemicals for a safer home environment https://nokout.com/replace-your-toxic-household-cleaning-chemicals-for-a-safer-home-environment/

[4] Tajana Klepac, Ivana Busljeta, Jelena Macan, Davor Plavec, Rajka Turk: Houshold chemicals – common cause of unintentional poisoning, Institute for Medical Research and Occupational Helath, Zagreb, Croatia, e 2nd Croatian Congress of Toxicology (with international participation), Pula, Croatia, 9–12 April 2000.

Pawel Gromek

Operational risk and epidemic risk reduction

Abstract

Experiences from last 3 years prove that epidemic is a kind of a disaster trigger which influences on both people in danger and security entities. They shed a light also on specifics of epidemic risk reduction. Theory of operational risk allows to analyse epidemic risk reduction regarding to practical constraints. This forces to consider organisational aspects of the reduction (including internal processes, staff, IT systems and external events) but facilitates to answer questions hard to be answered with the use of classical security methods. Thus operational risk is a promising direction of disaster risk reduction.
Keywords:disaster; risk; disaster risk reduction; epidemic; disaster management.

Introduction

Epidemic risk has been growing for last years. COVID-19, swine flu, bird flu, cholera and Ebola are only the chosen examples of infectious disease which shape this trend. Climate change and globalization accelerate relevant process as well. An epidemic is able to change normal operation of a local community, a society and societies. Limitation of movement in public spaces, obligation to use personal protection means, changes in work forms (online solutions, non-stationary solutions), vaccination, societal monitoring and necessity to stay at home in terms of quarantine and isolation are far from normal life of individuals and their groups. They may cause organizational, physical and mental consequences conducting to a new reality.

Thus, an epidemic may be a trigger of a crisis situation and a disaster. As far as the first term is concerned, epidemic may cause a situation when a public administration is not able to cope with it without external support. The second term means that local community is not able to face a disaster conditions. This regards not only public administration but also public services, social groups, entrepreneurs, volunteers, armed forces, etc.

In addition, security entities are not epidemic resilient. It is hard to ensure operational continuity of security entities when epidemic occurs due to a risk of infection and other epidemic derivatives.

Consequently, there is a strong need to look for concepts facilitating more effective disaster management in terms of epidemic risk reduction. Experiences of COVID-19 may be referenced here just like implementation of organization theory and practice. Concept of operational risk seems to be valuable and up to date solution to face relevant cognitive challenges.

Objective

The research objective is to analyse a profile of operational risk in epidemic risk reduction respecting epidemic conditions. May attention is put on direct relation between operational risk determinants (internal processes, staff, technical solutions and external events) and epidemic.

Method

Theoretical methods of security studies are used (analysis, synthesis, classification, logical concluding). In addition, author considered results of statutory research entitled ‚Operational Risk in Operation of Societal Security Systems'. The research was carried out at the Main School of Fire Service in 2021.

Findings/results

Epidemic risk reduction is a kind of disaster risk reduction. Thus, it concerns situations and conditions in which local community is not able to cope with them without external support.
Corresponding to disaster risk reduction concept, epidemic risk reduction directions are (GAR, 2022:

1) limiting a hazard power;
2) reducing vulnerabilities;
3) shortening exposure;
4) strengthening resilience;
5) shaping coping capacities.

Epidemic specifics impede practical realisation of the reduction manners. It is expressed in operational risk of security entities.
Ensuring effective epidemic risk reduction should focus on internal reduction processed (the processes related to relevant directions and stemming from new epidemic reality – e.g. non-stationary work), personnel involved (for example sanitary services, fire services, police, military troops, volunteers, etc.), technical systems of epidemic control and monitoring and external events (personnel infections and even deaths, abstentions at work, information chaos, etc.).
An attention should be paid on lowering probability of operational threats, limiting causes of their materialization and increasing relevant response capabilities.
Epidemic-determined evaluation of security systems and entities must reflect operational risk (for example when giving additional tasks for fire service officers entitled to medical rescue and transfering public administration workers to support epidemic response).
Total operational risk (summed for all security systems and entities) must be at optimal value (the lowest in current circumstances).

Conclusion/suggestions

Disaster risk reduction is international strategy for shaping security with potential to be used in the face of epidemic.
Epidemic is very characteristic kind of a disaster trigger which affects both community in danger and security entities. This forces to conduct protection operations with ensuring own protection of entities (especially staff).
Operational risk is promising direction of research related to disaster risk reduction and disaster management. It has significant role in ensuring safety and security of security entities and their operations.

References

[1] Gromek, P. (2023) Epidemic Risk Reduction. A Civil Protection Approach. Routledge: New York-Oxon.

[2] Gromek, P. (2022) Civil Protection System in the Face of Epidemic (orig. System ochrony ludności w obliczu epidemii). The Main School of Fire Service: Warsaw. GAR (2022) Global Assessment Report on Disaster Risk Reduction. Our World at Risk: Transforming Governance for a Resilient Future. UNDRR: Geneva.

[3] Gromek, P., Wojakowska, W. (2021) ‚To Manage Societal Security in COVID-19: Operational Continuity of Fire Rescue Service in Disaster Conditions'. European Research Studies Journal, XXIV(3), pp. 833-850.

László Teknős

Sustainability Aspects of Disaster Management

Abstract

Nowadays, the professional issues of climate policy, climate protection and sustainable development have come to the fore, and due to their ecological, social and economic effects they have become significantly more valuable at the governmental, law enforcement as public levels. Environmental and humanitarian crises of the 21st century require such global governmental action plans that are more rational to execute, as well as joint actions, a system of practical measures that focuses on prevention, and the legal-technical system of reducing the possibility of related risks. The question, however, is to what extent sustainable development – bearing nominal and actual importance – is able to ensure the long-term survival of humanity by predestining the directions of development, taking into account the avoidance of collapse. The timeliness and importance of the topic is demonstrated by the fact that more and more countries and organizations are adopting carbon neutrality globally. In order to achieve sustainability and environmental policy goals, law of enforcement must not be neglected. Hungary has made very good progress (at international level) in terms of sustainability goals and climate protection programmes. The commitments are stringent and it is in the national interest and duty to meet them. In this presentation, the author *studies* current theoretical and practical issues of sustainable development, climate protection and climate policy, as well as evaluates the products of relevant conferences. After a review of the literature, it presents the main research results and the main points of the international discourse. Based on this, the author further studies the position, nature and role of law enforcement, with special regard to disaster management in relation to sustainability. The compatibility of current 'green' developments and security challenges is further examined, looking into their synchronicity, and how those affect the strictly regulated tasks system and basic end uses of disaster management (in particular on emission reduction, adaptation, awareness raising and communication). In this presentation, the author examines The relationship between climate protection, sustainable development and state involvement is also examined, as well as the compulsion of growing social security needs, the measures taken by the professional disaster management organisation for sustainability.
Keywords: sustainable development, climate policy, climate protection, disaster management, emission reduction, adaptation, awareness raising, communication

Objectives/Methods

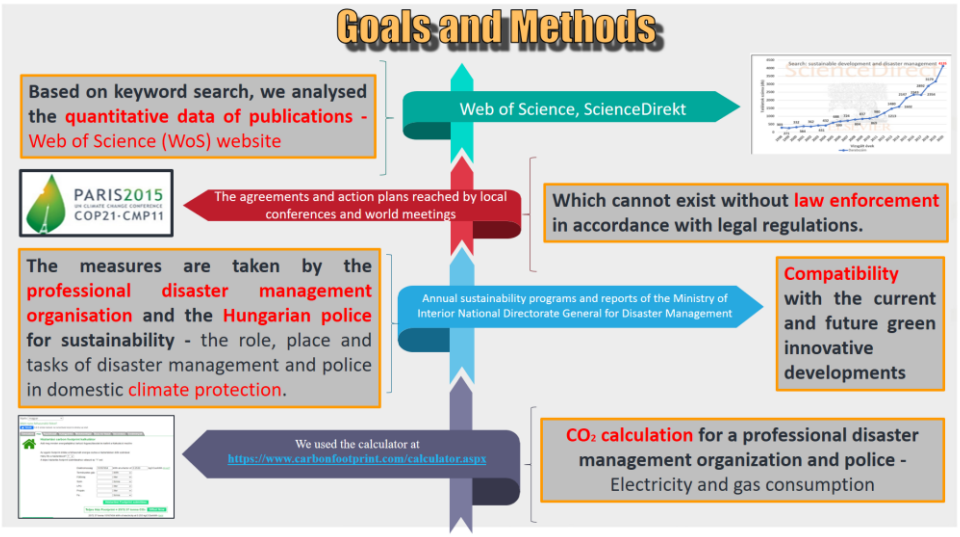


Figure 1 - Goals and Methods. Created by the Author.

Nowadays, the professional issues of climate policy, climate protection and sustainable development have come to the fore, and due to their ecological, social and economic effects, they have become significantly more valuable at the governmental, law enforcement and public levels. Ont he way to climate neutraity, the role of domestic disaster management agencies must be examined. In this paper I examine the measures are taken by the professional disaster management for sustainability, especially in terms of emissions reduction, adaptation and attitude formation.

Results

The question immediately arises here: Does Disaster Management have a place, a role, and tasks in sustainable development?
The answer is yes, based on the national climate strategy2.
It divides climate protection into three parts, such as emission reduction, adaptation and attitude formation.

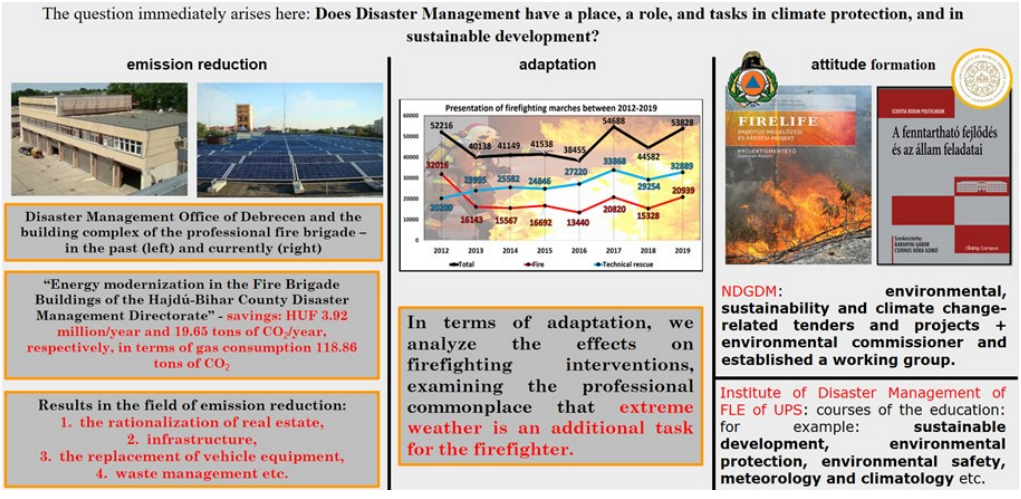


Figure 2 - Results of this paper. ted by the Author

emission reduction: Results in the field of emission reduction include the rationalization of real estate, infrastructure, the replacement of vehicle equipment, waste management, etc.

You can see in left part of this slide the Disaster Management Office of Debrecen and the building complex of the professional fire brigade – in the past (left) and currently (right). The building of the Debrecen fire brigade was designed in 1979 it was built between 1981-1983. It can be seen in the Figure that its appearance is obsolete. The building complex was renewed within the framework of the tender entitled KEOP.
In terms of operating costs and savings, the electricity consumption of the old building complex is 160 MWh/year. Its mean circa 8million forint/year. At the new complex, this is 83 MWh, which means 4 million HUF/year (savings: HUF 3.92 million/year and 19.65 tons of CO_2/year, respectively, in terms of gas consumption 120 tons of CO_2). For professional disaster management agencies, its annual gas consumption for 220 properties in 2019 is 7,263 tonnes of CO2. Similarly, for 296 consumption sites, the annual electricity consumption is equivalent to 3750 tonnes of CO2.
If We Look At This Particular Police Department, as a result of the Calculations Of 2013, The Nationally Consumed Energy (Natural Gas And Electricity) Is 15860 Tons. The Carbon Footprint Of The State Police Of The County Of Pest In 2015 Is A Rounded Up 5700 Tons Of Co_2. The electricity consumed by the University of public service in 2013 is equal to 1,028 tons of CO2.
Within the framework of e-mobility, already a technology is also used in law enforcement. An example of this is the electric fire-fighting vehicle, manufactured by Rosenbauer International. 500 million Forint each. If we look at the fact that there are 239 fire trucks (vehicles) in Hungary, it would currently be about 120 billion Forint. The annual budget of the organisation itself is 85 billion Forint. The hydrogen propulsion system is also worth mentioning, which is currently unable to be put into operation in Hungary. There are no charging stations established. It is even more expensive. Overall, a technology is not the good technology, as these will serve the environment and energy policy goals in parallel.

Adaptation to the negative effects of climate change will not be discussed, as I could go on for hours about how to protect against it.

attitude formation: The fact that disaster management has participated in a number of environmental, sustainability and climate change-related tenders and projects, within the framework of which a wide range of information directly or indirectly provided the population with information that has presumably increased or shaped their climate awareness, also helps to shape attitudes.

In terms of *shaping attitudes*, in the coordination and participation of the Institute of Disaster Management of the Faculty of Law at the University of Public Service, there are courses on the basis of education such as sustainable development, environmental protection, environmental safety, disaster prevention, master's degree in environmental protection, meteorology and climatology.
Sustainability communication is still in its infancy. The communication message is mainly about fire prevention, carbon monoxide poisoning, disaster management rules, and not about environmental content. I am actually the only one researching this topic. Carbon neutrality cannot be without disaster preparedness.

In order to calculate the energy cost ratio of administration, it is necessary that the data of all workstations used for authorities activities operating with electricity be summed up and distributed by the delta value of the working time expressed in hours. The energy demand and performance, the P value, can also be obtained by dividing the total value of the energy changes and the time change. The eta, the efficiency is obtained by the quotient of the P value and Q, that mean, how many decisions were made during a given working time. The EH, as an energy cost ratio indicator is obtained by dividing the product of the eta and the price of electricity by the number of employees.

But what do we need for an electronic public administration system to be efficient and successful?

First of all, there is a need for a software or application with a user-friendly interface, which takes into account the fact that it is transparent, reduces administrative burdens, and at the same time helps clients access the necessary data, as well as the transparency of business processes without IT knowledge. Can also guarantee stability and reliability are also important features, since must be guaranteed both by the authority and the client side and for this, a suitable infrastructural background is also necessary. The situation is that the workforce is essential for every change at the organizational level and in this case, the appropriate level of preparation of the staff of the public administration and ensuring the motivation to use the new system. If these are present, then we can say that the last element is absolutely necessary. This can be considered one of the most important, namely openness and motivation on the part of citizens and entrepreneurs towards the application of the new system. The existence of these structured from the bottom up is necessary in order for an innovative process improvement system to contribute to successful and efficient e-public administration.

Conclusion

The Ministry of Interior greatly emphasizes the establishment and maintenance of more economical and environmentally friendly institutional functioning.

1. The answer to the question of whether a professional disaster management organisation should play a role in the triple climate protection system is yes
2. They strive for environmentally friendly organisational operation

The professional disaster management organization will (has) an increasing role in climate protection. Prevention is very important, but as an intervention body, the main focus remains on response and adaptation.

3. Based on the above examples, it can be concluded that the Environment and Energy Operational Program promotes progress towards sustainable development and (in a broader sense, in the long run) improves the country's competitiveness.

The advantages of the measures taken for sustainability include the modernization of disaster protection buildings, doors and windows, energy supply systems, significant reduction of operating costs, improvement of the price – value ratio of buildings demonstration effects (beautification and renovation of buildings, public buildings, environmental awareness) will contribute to the country’s long-term security of energy supply and competitiveness.

4. The tasks were undertaken to meet the criteria of sustainable development clearly increase the high level of implementation of the conditions set out in the basic mission, such as modern vehicles, equipment, more modern barracks, administrative principles, more advanced response methods, etc., all increase the professionalism of the professional disaster management organization.

Overall, the thirteenth sustainability objective is being implemented, but the focus is on reducing organisational operating costs rather than striving for sustainability.

Climate protection and the sustainable development are a global matter. The current accelerating ákszörölléting schedule should not be overlooked. There is no vaccine for this, but there are opportunities.

References

[1] Alida Kiss; Jozsef Ambrusz: *Scientific research difficulties of post-earthquake rehabilitation* pp. 415-420., 6 p. (2021)

[2] Fumiso Muyambo; Agoston Restas; Andries Jordaan; Laszlo Bodnar: A life-saving technology supporting crisis management: Unmanned Aerial Vehicle (UAV) in developing countries. *DELTA: Vedecko-odborný Časopis Katedry Protipožiarnej Ochrany* 11 : 22 pp. 20-27., 8 p. (2017)

[3] Gergo Erces; Laszlo Berczi; Sandor Racz: The effects of the actively used reactive and passive fire protection systems established by innovative fire protection methods for whole life-cycle of buildings. *Műszaki Katonai Közlöny*. XXVIII: 4 pp. 47-58., 12 p. (2018)

[4] Laszlo Bodnar; Agoston Restas: Examination of the forest fires detection: the relationship between the fire and the detection. In: Viegas, Domingos Xavier (ed.) Advances in forest fire research 2018. *Imprensa da Universidade de Coimbra*, pp. 995-1001., 7 p. (2018)

[5] Laszlo Bodnar; Peter Pantya: The Threat of Forest and Vegetation Fires and the Possibilities of Intervention in Hungary. *Academic and Applied Research in Military and Public Management Science* 18:3, pp. 21-31., 11 p. (2019)

[6] Klara Siposne Kecskemethy; Laszlo Teknos: North Atlantic Treaty Organisation’s climate change risk management responsibilities. *BELÜGYI SZEMLE* 71:1. KÜLÖNSZÁM pp. 58-83. (2023)

Vásárhelyi Örs – Dobor József – Ambrusz József

IoT as a tool in achieving Disaster Management purposes

Abstract

Our 21st. century society also called an information society after Alvin Toffler's theory. The term "information society" refers to a society where information and communication technologies (ICTs) play a central role in the economy, politics, culture, and daily life of individuals and organizations. The biggest driving force of our society is information and know-how. [1]Therefore our society is dependent on info-communication networks and info-communication devices. These devices and networks make our lives much easier than anything else before. The emergence of the IoT (Internet of Things) enabled the emergence of smart devices and smart cities, infrastructures, etc. These devices are spread around and have been collected a lot of data from their sensors, which can optimize a lot of processes and decision-making, they used mainly in the industry, and this technology brings us the fourth revolution of the industry. In the market, there are a lot of smart fire protection devices which can communicate with each other or the authority's information system. In addition to the advantages, these devices have many disadvantages, and there are also dangers of exchanging data on the Internet. This research primarily aims to draw attention to the possibilities and dangers of smart devices.
Keywords: IoT, smart devices, disaster management, cyber defense, fire protection, industry 4.0, industrial safety

Introduction

There are a lot of devices that can communicate with each other via the internet without any human interaction, these devices are called IoT devices. IoT means "Internet of Things", and refers to the growing network of physical devices and objects that are connected to the Internet and can collect and share data with each other. [2] This network includes a wide range of devices, such as sensors, appliances, vehicles, and even buildings and cities, all of which are equipped with embedded technology (such as microprocessors, sensors, and communication hardware) that allows them to communicate and exchange data with other devices over the internet. The main goal of IoT is to enable these devices to work together seamlessly, collecting and analyzing data in real-time to create new efficiencies, improve decision-making, and create new opportunities for businesses and consumers alike.

Methods

Owing to the topic's actuality, it is necessary to constantly monitor legislation, case studies, and accidents. The authors used inductive and deductive methods for the analytical analysis and for processing the source work found in the literature. Furthermore, it was important to examine domestic and EU legislation.This article was conceived to raise attention/awareness of the advantages and disadvantages of IoT-based smart devices.

IoT devices in fire protection

Nowadays, we hear more and more about the concepts of smart cities and smart homes. A smart home is a home (house or flat) that is equipped with devices, appliances, and systems that are connected to the internet and can be remotely controlled or automated to increase comfort, convenience, and energy efficiency. Many fire protection IoT devices exist and are available in the market. These are practically classified as security solutions for smart homes and smart buildings. IoT devices, sensors, and other solutions can play an important role in improving fire safety by detecting fires early, generating alerts, and facilitating quick and effective responses. IoT devices can be used to automate emergency response procedures, such as activating alarms, and the doors providing the escape route in buildings capable of accommodating a large number of people, are opened in the event of a fire alarm. Overall smart fire protection solutions can be implemented into existing ones. This automation can help reduce response times and generate alerts. In summary, IoT devices, sensors, and other solutions can provide valuable data and automation to improve fire protection in buildings, helping to prevent fires, reduce damage and keep building occupants safe. [2] In Hungary doesn’t exist this wide-range IoT-based fire protection system, but the main goal of the government's National Digitization Strategy is to take advantage of the opportunities inherent in digitization and thereby significantly increase the country's competitiveness and the well-being of its citizens. [3]

Applicability of IoT in plants dealing with hazardous materials

Due to the IoT, and other IT solutions such as cloud computing, in the early 2010s, Industry 4.0 suddenly appeared. This allows for real-time data exchange between machines, production systems, and humans, leading to more efficient and flexible production processes, increased productivity, and higher-quality products. [4] The IoT solution could help to improve the safety management system (SMS) of hazardous plants. IoT devices and Machine to Machine (M2M) communication could reduce the human factor, which is the main source of serious industrial accidents. [5] IoT sensors and devices can play a critical role in improving hazardous plant safety management systems by providing real-time data that can help identify potential hazards and prevent accidents before they occur. [6] Real-time data collected with sensors, e.g. on the amount of hazardous substances, could also help the work of the industrial safety authority.

Vulnerability

While IoT devices offer many benefits, they also have security vulnerabilities that can be exploited by hackers. These vulnerabilities include weak authentication and authorization, insecure data storage, lack of encryption, and unpatched software. One of the main vulnerabilities of IoT devices is that they are designed to be cheap and easy to use, which means they don't necessarily have the same level of security features as more expensive devices. [7] [8] [9] This makes them more susceptible to hacking and other cyber attacks. Another big security challenge of the IoT environment, automated units of IoT devices have brought a new kind of threat to people's personal data. IoT nodes are collecting people's private data without them even realizing it. Most privacy laws require that users be informed about how their personal information is managed and

administered. As the number of IoT devices continues to grow, it is increasingly important to address these vulnerabilities to ensure user security and privacy. [7]

Conclusion

IoT-based sensors and smart devices could help according to domestic legislation, plants dealing with hazardous substances in the development of their safety management system. The collected tons of data by the sensors could make more efficient of the PDCA cycle. Ultimately, reducing the risks of serious industrial accidents. Approaching the topic from the aspect of fire protection, various smart fire protection devices would be able to help the work of the intervention staff. Also, these devices' automatic monitoring features can reduce the risk of fire formation or reduce its effect. The fire protection authority can benefit from the large amount of data collected by the sensors. Moreover, these data can even be used during the fire investigation.

It is obvious that IoT devices have many advantages and possibilities of use. However, a significant number of these devices do not have adequate protection against threats in cyberspace. So it is extremely important to protect IoT devices and the data they manage against unauthorized access. [10]

References

[1] A. Toffler, A Harmadik Hullám, Budapest: Typotex Kiadó, 2004. Isbn: 978-963-9326-21-7

[2] G. Érces And G. Vass, "Okos Épületek, Okos Városok Tűzvédelmének Alapjai Ii. Rész," Védelem Tudomány, Vol. Vi., No. 2., Pp. 1-18, 4 2021.

[3] Miniszterelnöki Kabinetiroda, "Nemzeti Digitalizációs Stratégia 2022-2030," 2022. [Online]. Available: Https://Cdn.Kormany.Hu/Uploads/Document/6/60/602/60242669c9f12756a2b104f8295b866a8bb8f684.Pdf. [Accessed 12 04 2023].

[4] S. Ászity And F. Dömötör, Ipar 4.0, Budapest: Akadémiai Kiadó, 2019. Isbn: 978 963 454 275 9

[5] S. Shea, "Machine-To-Machine (M2m)," Techtarget, [Online]. Available: Https://Www.Techtarget.Com/Iotagenda/Definition/Machine-To-Machine-M2m. [Accessed 10 04 2023].

[6] Kaspersky, "Pushing The Limits: How To Address Specific Cybersecurity Demands And Protect Iot," 2022. [Online]. Available: Https://Www.Kaspersky.Com/Blog/Iot-Report-2022/. [Accessed 06 04 2023].

[7] M. Conti, A. Dehghantanha, K. Franke And S. Watson, "Internet Of Things Security And Forensics: Challenges And Opportunities," Future Generation Computer Systems, Vol. 78, No. 2, Pp. 544-546, 01 2018.

[8] Nemzeti Kibervédelmi Intézet, "Iot Eszközök Biztonsági Kérdései," 2022. [Online]. Available: Https://Nki.Gov.Hu/Wp-Content/Uploads/2022/09/Iot-Eszkozok-Biztonsagi-Kerdesei_Ii_Cti_Jelentes.Pdf. [Accessed 02 04 2023].

[9] L. Oláh, "Az Iot-Eszközök Veszélyei," Pécsi Tudományegyetem Műszaki És Informatikai Kar, 03 01 2023. [Online]. Available: Https://Mernoknok.Hu/Az-Iot-Eszkozok-Veszelyei/. [Accessed 05 04 2023].

[10] Eset, "Hogyan Elemezzük Iot Eszközeink Biztonságát?," 15 03 2018. [Online]. Available: Https://Www.Eset.Com/Hu/Hirek/Hogyan-Elemezzuk-Iot-Eszkoezeink-Biztonsagat/. [Accessed 04 04 2023].

Section E – Safety and security

Noémi Kiss –József Dobor

Cyclohexane cloud explosion in Flixborough

Abstract

To establish the current acceptable safety status of many chemical installations currently operating in Europe, it was necessary to draw conclusions from a number of industrial incidents. As a result of the Flixborough accident and the Seveso accident in Italy in 1976, the European Council has drawn up a directive, SEVESO I, to ensure harmonisation of the management and control of industrial activities posing a significant risk in the Member States. The Directive established a single framework for Member States and laid the foundations for the safety of industrial activities. It aims to prevent major accidents from certain industrial activities in Europe and to minimise the consequences for people and the environment.

Keywords: fog explosion, chemical incident, significant risk, consequences

Introduction

The Flixborough chemical plant was located in an agricultural area 260 kilometres north of London. The plant started life as a fertiliser factory and was converted to the production of caprolactam, a raw material for nylon manufacture, in 1964 when it changed hands. The annual production of cyclohexane was around 70 000 tonnes. The temporary solution with the elbow pipe worked well temporarily at the start of the restart, when another leak was detected and the plant was shut down. Repairs were then carried out and the plant restarted on 1 June, but the temperature and pressure values in the plant were not checked. Flames 70 to 100 metres high and all fire protection equipment near the explosion were destroyed, making it difficult for rescue teams to extinguish the fire, which lasted two and a half days.

Objective

Case studies, when prepared with the indispensable assistance of independent experts, investigators, and with the most available information, can be a very important professional background for industry professionals, primary investigators, and academics teaching chemistry and physics. The topic covered has a substantial literature background, which has given the authors the opportunity to gain insight into the deeper, more technical reasons that explain the occurrence of the damage event.

Method

The solution used is to study the available literature to identify the case. Of course, the authors are aware that the case in question occurred more than 40 years ago. But it was chosen because it is a well documented subject, with numerous examples, and is a recommended topic for practically all European disaster

management professionals. Mechanical engineers are responsible for developing safety requirements for equipment. and keeping process management systems and the activities required to maintain them up to date. information. This may include, but is not limited to, characteristics of vessels, reactors, such as maximum (and minimum) allowable operating pressures, maximum allowable temperatures, minimum allowable temperatures, materials, and vulnerability of piping and equipment to stress cracking, thermal cycling, and stress analysis that may contribute to hazardous events. In the design phase, mechanical engineers can work with chemical engineers to select the most suitable equipment for a particular chemical process, as they contribute to the reliability and maintainability of process equipment. More reliable equipment increases the safety of the chemical process.

Findings/results

The temporary connection was not suitable for the temperature and pressure in the installation. Therefore, it was deformed and could not perform its function, resulting in the release of 30 tonnes of cyclohexane in a short time (about 1 minute). The incident claimed 28 lives, 18 of them working in the control room. In addition, it can be stated that the number of casualties would have been much higher if the incident had occurred on a weekday rather than on a Saturday, when the number of daytime workers on site was low. In fact, the entire plant was destroyed. Neighbouring residential buildings suffered extensive damage. The fire lasted for more than three days and affected 10 hectares. There have been many steam/air explosions over the past 100 years, yet little is known about the conditions that led to an unconfined steam cloud explosion or the mechanisms that lead to such an explosion. We do not know to what extent it is possible to obtain this information, but if it is possible, it would clearly be useful. Factors leading to the disaster: the chemical plant had a long-standing vacancy for a plant maintenance engineer. No one at the plant had the specialised mechanical engineering qualifications and experience required to perform plant maintenance engineering tasks. At the time of the accident, more than 1.5 million litres of hazardous substances were stored on the plant site, more than 50 times the permitted amount. Investigators believe that the accident was caused by the failure of a temporarily installed pipe and the resulting cloud of cyclohexane, which ignited and exploded when it came into contact with the reforming tower of a hydrogen unit 100 metres from the leak.

Conclusion/suggestions

The process or equipment modification is reviewed and implemented by persons with the knowledge appropriate to the process. situation. This event is important in the history of process safety. Unfortunately, prior to the incident, there was no engineering review of a minor change to process equipment.
At the time of the explosion, 72 people were on the premises, 28 of whom were killed and 36 seriously injured. Outside the chemical plant, 53 people were injured, but there were hundreds more slightly injured, of which no official figures are available. All buildings within about 600 metres of the explosion were destroyed. A total of 1820 residential units and 167 shops were damaged. Property damage exceeded $100 million. [4] Fishing has been banned on the River Trent near Fixborough. The fortunate factor in the accident was that it was a weekend, as there could have been many more fatalities if the accident had occurred on a working day when all 550 employees were on the plant site.

References

[1] Department of employment, The Flixborough disaster, Report of the Court of Inquiry, London: Her Majesty's Stationery Office, 1975, ISBN 011 361075 0, Parker, Roger Jocelyn.; Great Britain. Department of Employment. London : H.M.S.O.; 1975

[2] Introduction to Process Safety for Undergraduates and Engineers, Center For Chemical Process Safety Of The American Institute Of Chemical Engineers New York, NY, 2016, ISBN: 978-1-118-94950-4

[3] CCPS 2008, "Incidents That Define Process Safety", American Institute of Chemical Engineers, New York, NY, 2008.

[4] CCPS 2013, "Guidelines for Managing Process Safety Risks During Organizational Change, American Institute of Chemical Engineers, New York, NY, 2013.

[5] CCPS Process Safety Beacon, Flixborough – 30 Years Ago, June 2004 (http://sache.org/beacon/files/2004/06/en/read/2004-06%20Beacon-s.pdf)

[6] CCPS Topics, Incident Summary: Flixborough Case History (http://www.aiche.org/ccps/topics/elements-process-safety/commitmentprocess-safety/process-safety-culture/flixborough-case-history)

[7] API RP 752, Management of Hazards Associated With Location of Process Plant Buildings, 3rd Edition, American Petroleum Institute, December 2009.

Réka Papp – József Dobor

Summary of damage incidents in Balatonfűzfő

Abstract

The repeated occurrence of similar incidents with serious consequences in an establishment or unit of an establishment or unit of an establishment engaged in a particular activity may indicate serious deficiencies. Many domestic incidents are related to the chemical industry, chemical process installations. It is worth mentioning that many Hungarian incidents from the last few decades have been less processed as case studies. The incident investigation report is, in many cases, not available. Many industrial accidents have occurred in recent decades during the manufacture and storage of explosives. It is an unfortunate fact that several such accidents have occurred in our country. The authors describe the incidents at the Balatonfűzfő plant unit, their consequences and possible lessons to be learned.
Keywords: explosion, chemical incident, consequences, explosives

Introduction

Several events with serious consequences took place in the examined plant: August 15, 1977 - Nitroglycerin explosion at the Nitrochemica Dózsa 1 plant in Balatonfüzfő. June 14, 2006 - Pyrotechnic explosion at Balatonfűzfő. December 22, 2016 - An explosion occurred at the nitrochemical plant in Balatonfüzfő

Objective

August 15, 1977 - Nitroglycerin explosion:

- the line from the dispenser could have exploded all the way to the storage tank and reached the tubs full of nitroglycerine
- 3.5 tonnes of nitroglycerine exploded
- Number of fatalities: 4
- The exact cause of the disaster is still unknown

June 14, 2006 - Pyrotechnic explosion:

- The warehouse had a floor area of about 40x14 m and could store 50 tons of pyrotechnic products.
- pyrotechnic devices for fireworks were stored
- The warehouse was completely surrounded by a strong earth wall, about 5 metres high, which served to contain the air pressure that would have been generated by the explosion.
- Number of fatalities: 4
- Material damage: estimated at HUF 80 million

December 22, 2016 - An explosion occurred at the nitrochemical plant:

- 5 tonnes of chemicals exploded due to negligence
- the head of the chemical company, did not know that sodium chlorate and sugar could not be kept side by side
- about two shovels of granulated sugar spilled from one of the bags, mixed with the sodium chlorate and ignited

- Subsequently, more than 5 tonnes of sodium chlorate and granulated sugar stored on the premises exploded

Method

During the precise investigation of the damage, the experts conducting the investigation examine some important questions, for example:
Have all hazards and risks related to production or storage of explosives and fireworks been identified and analysed?
How do the safety procedures address the possibility of an explosive substance being dropped?
What kind of active fire protection system is used in the storage buildings and production sites of explosives?
Has your company ensured that enough separation distances are maintained from all explosives storage buildings and production facilities and other buildings? If not, what measures have you in place to prevent a domino effect from one building to another?
If the answers to the questions are not clear, they continue in that direction. If structural testing is possible, you can keep your assumptions after sampling. Eyewitnesses, employees, and first responders can also provide essential information.

Findings

Systems are created and maintained to be tolerant of, or failsafe against, a large number of errors and lapses.

1977: The experts quickly ruled out the possibility of sabotage, but all they really found out was that everything had been done according to the rules. The exact cause is still unknown.

2006: Lóránt Losonczi, the commercial manager of Crescom Kft., which rents the warehouse, said that they were completely baffled by the incident, as they had undergone an official inspection shortly before the accident, which found everything to be in order. No fireworks were assembled in the warehouse and the building was only used for storage.

2016: According to the indictment, the plant manager was not aware of the properties of sodium chlorate, despite his training as a chemical technician and the occupational rules that applied to him, and that it was forbidden to store it with combustible materials. The plant manager of a chemical company in Balatonfűzfő was charged with negligent endangerment in the course of his work.

Conclusion

The key lesson to be learned from the explosion is the importance of due diligence and compliance with installation rules.
The earth chain did its job extremely well, as it deflected the shock wave generated by the explosion, protecting the occupants and the surrounding facilities. Without the earth chain, the explosion of around 50 tonnes of fireworks would have had unforeseeable consequences. (2006)

As time has progressed, so has the regulatory regime, if you look at what happened in 1977 and 2016.
The case studies showed that human error was the main cause of the damage. This problem can, of course, be significantly reduced by updated official controls, continuous training of workers and study of the description of the incidents by employers.
The authors suggest that the companies concerned (both employees and employers) should be given the opportunity to discuss the conclusions of the accidents presented, and other similar accidents, in an organised manner, in professional forums with the involvement of the authorities.

References

[1] Bokros István, Dr. Mannheim Viktória, Dr. Siménfalvi Zoltán, Dr. Szepesi L. Gábor: Por- és gázrobbanás elleni védelem, Nemzeti Tankönyvkiadó, html: http://dtk.tankonyvtar.hu/xmlui/handle/123456789/7511

[2] Florin Ionel Burdea, Monica Crinela Burdea: Principles for designing a computer application specific to explosion risk management in explosive deposits , https://doi.org/10.1051/matecconf/202235400005

[3] Szakál Béla,Cimer Zsolt: Problémák a robbanóanyagok tárolásából származó kockázatok elemzésében (Tanulmány), html: https://kvi.uni-nke.hu/document/kvi-uni-nke-hu/szakal-cimer-palyazati-anyag.original.pdf

[4] Federico Canfarini, Andrea Pietro Reverberi, Marco Vocciante, Bruno Fabiano: Safety Concerns and Chemical Aspects of Improvised Explosive Devices and Homemade Explosives, ISBN 978-88-95608-89-1; ISSN 2283-9216, DOI: 10.3303/CET2291031, html: https://www.cetjournal.it/cet/22/91/031.pdf

[5] Lessons Learned Bulletin No. 8, Chemical Accident Prevention & Preparedness, Major accidents involving explosives, Number 8 December 2015, JRC99808, https://minerva.jrc.ec.europa.eu/en/shorturl/minerva/mahb_bulletin_no8_fortheweb_a4pdf

[6] https://www.vedelem.hu/letoltes/anyagok/80-pirotechnikai-robbanas-balatonfuzfon.pdf

Bianka Szarvas – József Dobor

Three Mile Island Nuclear Power Plant-the most famous nuclear accident in the US

Abstract

The authors have attempted to present a less frequently dealt with case of damage. The 1979 incident at a nuclear facility in the USA negatively affected the perception and acceptance of nuclear power plants for several decades. Today, it is considered in professional circles, along with Chernobyl in 1986 and Fukushima in 2011, as the largest nuclear facility incident. This is precisely why the authors have chosen to work on this topic. The damage event of 1979 is described on the basis of the available literature.
Keywords: nuclear power plant, industrial accident in a nuclear facility

Introduction

A series of obvious errors and equipment failures, coupled with some questionable instrument readings, led to loss of reactor coolant, zone overheating, fuel damage but probably not melting, and limited off-site release of radioactive noble gases and iodine. After the fission reaction stopped, the fuel core of the TMI-2 reactor became untreated and more than a third of the fuel melted. Inadequate instrumentation and training programs at the time hampered operators' ability to respond effectively to this type of accident. A serious problem was that the news coverage following the accident was fraught with a communication anomaly that led to contradictory information for the public, which contributed to the public's fears. A relatively small amount of radiation was released from the plant. The emissions were not serious and did not pose a health hazard. This was confirmed by thousands of environmental and other samples and a series of independent measurements during the accident. The containment building worked as planned. Even though about a third of the fuel core had melted, the reactor vessel itself remained intact and contained the damaged fuel.

Objective

One of the main reasons for this accident, based on the professional opinions that can be gleaned from the case studies, is the inadequate preparation of the operators. Therefore, in the publication, the authors emphasize the importance of disaster prevention training in higher education. Acquainting future specialists with case studies, of course, in addition to practical training, definitely contributes to the ability to intervene effectively and quickly recognize the situation.

Method

Basically overheating of the pressurized water reactor (PWR) zone was the basis of the feedwater pump failure and caused the coolant to leak.
Some critical factors: The backup emergency cooling water system was down for maintenance and the secondary backup system was not available. The operators of the control room could not identify the coolant level loss around the reactor core, so they did not see what level of damage was unfolding. Due to undesirable

processes taking place in the primary cooling water circuit, there was no convection cooling.

Findings

The root causes are as follows: the design of the reactor was inadequate. Inadequate instrumentation. The operators received too many alarms, too much information, management anomalies. The operating personnel received inappropriate (inefficient, too theoretical) disaster prevention training. Communication was not good (toward the primary responders and the authorities). Some positive effects of the damage event in the literature: The expansion of safety-oriented inspections and the use of risk assessment to effectively identify the vulnerability of any power plant to serious accidents. Installation of auxiliary equipment (decision support systems) by operators to mitigate accident conditions and to continuously monitor radiation levels and plant conditions. Implementation of programs by operators and authorities for the early detection of safety-related problems, as well as the collection and evaluation of relevant data, so that operating experiences can be shared.
The main generic lessons learned and they categories

- Increased technical support for reactor operation and safety supervision
- More criteria for selection and training of operators, more complex control system in the event of failure and accident
- Equipment or design changes for improved easily operation of existing plants
- Evaluating long-term improvements in reactor design
- Setting up an emergency response organisations and a determined decision-making process
- Defining the practical objectives of reactor safety

Conclusion

There was no "China syndrome". Apart from the initial tension, the accident had no personal injuries or detectable health effects.
Longer term effects: It was essential to use the lessons learned from the accident, resulting in continuous improvement in the performance of all nuclear power plants. The study of the accident supported a better understanding of fuel meltdowns, including the likelihood of a "China syndrome" that, in a worst-case scenario, would breach the reactor vessel and containment structure. The population's fear of nuclear energy peaked in the period following the accident, mostly in the United States, and it sharply decreased after the accident at Three Mile Island. The 1980s and 1990s were probably the lowest point for nuclear construction in the world.
The 1979, 1986, 2011 nuclear facility events mentioned in the introduction occurred in the most diverse countries on our planet, relatively far apart from each other. The 1979 Three Mile Island event was an INES Level 5 (accident with wider consequences). Human error, design error, negative feedback from design deficiencies had unforeseeable consequences for operations. Humanity has learned from it. Today, nuclear power generation, after several decades of stagnation, is once again coming to the fore due to the growing demand for electricity.

References

[1] Miller, Kenneth. (1994). The nuclear reactor accident at Three Mile Island. Radiographics : a review publication of the Radiological Society of North America, Inc. 14. 215-24. 10.1148/radiographics.14.1.8128063., https://www.researchgate.net/publication/15071316_The_nuclear_reactor_accident_at_Three_Mile_Island

[2] Perrow, C. Normal accident at three Mile Island. *Society* 18, 17–26 (1981). https://doi.org/10.1007/BF02701322, https://link.springer.com/article/10.1007/BF02701322#citeas

[3] Analysis of Three Mile Island - Unit 2 Accident, NSAC-80-1, NSAC-1 Revised March 1980, Prepared by the Nuclear Safety Analysis Center, https://inis.iaea.org/collection/NCLCollectionStore/_Public/13/677/13677904.pdf

[4] VOLUME I I Part 2, three mile island, a report to the commissioners and to the public, MITCHELL ROGOVIN, GEORGE T. FRAMPTON, JR., NUCLEAR REGULATORY COMMISSION SPECIAL INQUIRY GROUP, https://tmi2kml.inl.gov/Documents/2b-Rogovin/NUREGCR-1250V2PT2,%20TMI,%20A%20Report%20To%20The%20Commissioners%20And%20To%20The%20Public%20(Rogovin%20Report)%20(1980-01).pdf

[5] Three Mile Island:The Most Studied Nuclear Accident In History, https://www.gao.gov/assets/emd-80-109.pdf

[6] IAEA BULLETIN-VOL 21, NO.5, https://www.iaea.org/sites/default/files/publications/magazines/bulletin/bull21-5/21502795459.pdf

[7] "President's Commission on the Accident at Three Mile Island. 1979: The Need for Change", Washington, D.C., U.S. Gov Printing Office. WNA Fact Sheet (https://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/three-mile-island-accident.aspx)

[8] Lessons From the 1979 Accident at Three Mile Island", Nuclear Energy Institute (NEI), October 2019 https://www.icheme.org/media/14096/three-mile-island-incident-summary-28-mar-79.pdf

Karina Gyürü - Georgina Nothartné Viszked – József Ambrusz

The cooperation of the forces involved in flood defense and the possibilities for the development of logistics

Abstract

Nowadays, logistics is present in all areas, including disaster prevention. The law regulates what logistical tasks must be performed in the event of a disaster, in order to effectively implement defense. These logistics tasks are important elements of national, regional and local bodies performing special tasks. We will present the development possibilities of organizing the available forces and tools, as well as the logistical background, so that the tasks arising from the floods can still be carried out.
Keywords: flood, logistical background, cooperation, intervening forces, tools

Introduction

Although the climatic conditions, economic characteristics and geographical determination of our country do not predict the occurrence of disasters, events that require the intervention of disaster management may nevertheless occur in Hungary. Prevention, defense and recovery are not only the task of the disaster management organization, but a complex system of tasks covering the entire society, in which professional (Disaster Management, Hungarian Defense Forces, Police) and non-professional (state, economic, voluntary) bodies participate, organizations too. A common goal during defense is to prevent damage, protect human life and property, and reduce environmental damage. For this, the necessary resources and technical equipment must be provided.

Objective

We prove that the tasks arising from floods can be effectively carried out by organizing the available forces and tools and ensuring logistics.
We aim to develop effective cooperation, because in this way the intervening forces can reinforce each other and carry out their defense tasks in the future as well.

Method

We carried out or research by applying several research methods in order to prove or reject the defined objectives and the established hypotheses.
In the defining part of our research work, we used general methods. We studied and processed the relevant domestic literature, took into account the relevant legal background and the internal regulations related to our topic.
We studied and processed the relevant international literature.
We compared the previous and current literature using an analytical method, both within each field and with the regulations of other fields.
We held consultations with experts experienced in the subject, who facilitated the development of my dissertation by presenting the connections of their own fields of expertise.

Findings/Results

Possibilities of using Drones

Nowadays, the use of drones is spreading at an increasing rate. It used to be used only and exclusively in the military field, but today it has been expanded to include civilian use. Since this is currently the most dynamically developing branch of aviation, it is therefore essential to continuously examine and develop it to make it as efficient and safe as possible for users.
The definition of the term differs from one literature to another, but the same thing comes to mind when people think of the word drone: a small, simple aircraft capable of performing various tasks, which can be controlled remotely and has special equipment. For many, it means entertainment and play, but for professionals it is increasingly a work tool. These aircraft are not completely unmanned, but systems operated by pilots but with remote control.
Today, countless drones are produced with different parameters. Their types can be distinguished primarily by flight range and flight height.

Cooperation of the forces involved in the defense

Disasters caused by floods threaten people's lives and material values mostly in developing countries. Disasters, including floods, do not know national borders, so they can strike in several countries at the same time. In addition to endangering human lives and property, they can also have a negative impact on the economies of the countries concerned. That is why the countries have a common interest in proper preparation, a series of preventive measures and the implementation of effective intervention and restoration works. The existence of international organizations and the establishment of international cooperation in the field of humanitarian assistance are essential for this common goal. Cooperation can take place at several levels: local, territorial, national and on international level.
Civil organizations also play a vital role in international cooperation.
The first reason why we hear about more disasters these days is the advanced media and communications. A disaster happened a long time ago, but people heard about it by word of mouth, experienced it firsthand, or maybe wrote about it in the newspapers. Today, wherever a disaster occurs in the world, it appears immediately on television and on the Internet, spreading the news to billions.
The increase in the number of disasters is influenced by the increased population and the increased population density. This is especially typical of developing countries. Some of the densely populated settlements with high population numbers are located on riverbanks and beaches, thereby increasing the risk of flooding.
Weather change, climate change, and global warming all have a harmful effect on the development of disasters. This is also largely related to developing technologies, public transport and industrialization.

Conclusion/Suggestion

Possibilities of using drones

In order to prevent the occurrence of floods, the accessibility of river beds and floodplains, as well as the appropriate quality and up-to-date condition of dams,

are essential. With the help of the drone, large areas and long river sections can be inspected in a relatively short time by means of aerial observation.
During the protection period, drone surveillance can be used to monitor areas that have already been flooded, as well as areas that are expected to be flooded. Based on these, it is possible to identify which areas are at risk, where defenses need to be strengthened, or where resettlement needs to begin.
Just like the occurrence of floods, their peak and subsidence can also be a slow process. Continuous surveillance is required in the priority areas, however, the surveillance by car or motorboat used under normal circumstances cannot be used in such cases. In these difficult times, aerial drone surveillance can provide the solution.
As a result of floods, dams are often damaged. Drones can also provide effective help in mapping their condition. In addition, they carry out reconnaissance and data collection activities that are essential for the prevention of future floods and for up-to-date modeling.
Drones are efficient, as they are easy to use and cost less. We can say that the tasks that have been carried out so far with traditional aircraft can be carried out using drones in the future. The use of drones is no longer just an option, but also an unavoidable duty for modern professionals.

Cooperation of the forces involved in the defense

The existence of international organizations and the establishment of international cooperation in the field of humanitarian assistance are essential for this common goal. Cooperation can take place at several levels: local, territorial, national and on international level. Civil organizations also play a vital role in international cooperation.
The increase in the number of disasters is influenced by the increased population and the increased population density. This is especially typical of developing countries. Some of the densely populated settlements with high population numbers are located on riverbanks and beaches, thereby increasing the risk of flooding.
Weather change, climate change, and global warming all have a harmful effect on the development of disasters. This is also largely related to developing technologies, public transport and industrialization.
A given disaster situation in one country can also affect other countries. To overcome these common problems, international cooperation is needed.
If necessary, the countries that have signed an agreement will share their available resources, tools and knowledge with each other, and then they will be able to fight disasters more quickly.
On the basis of legal regulation, in addition to professional disaster protection organizations, civil protection organizations can be established to perform tasks that occur in the special legal order. It is also necessary to mention the humanitarian organizations that do not participate in the eradication of the emergency as a rescue organization, but their work at the scene of damage is essential. They play an important role in the protection of life and property.

Summary

We presented the possibilities of organizing the available forces and tools, as well as the development of the logistical background, so that the tasks arising from the floods could be carried out even more efficiently.

We also drew attention to the importance of cooperation and its continuous development. As a result, the joint and strictly coordinated work of the intervening forces can be even more effective in the future.

References

[1] Restás Ágoston: A drónok közszolgálati alkalmazásának lehetőségei 2014.

[2] Kuti Rajmund – Grósz Zoltán (2016): Biológiai eredetű veszélyhelyzetek kezelése, előtérben a mentesítési feladatok. *Hadmérnök,* 11. évfolyam 1. szám

[3] Grimble, R., and M.K. Chan. (1995): Stakeholder analysis for natural resources management in developing countries. Some practical guidelines for making management more participatory and effective. Natural Resources Forum 19 (2): 113–124.

[4] Meen B. Poudyal Chhetri: Growing need of international cooperation in DRR. *Védelem tudomány*, VII. évfolyam 2. szám, 2022. 04.

[5] Nagasaka, T., and S. Ikeda. (2008): Strategy and Methodology for Disaster Risk Governance. Japanese Journal of Risk Analysis 17 (3): 13–23 (in Japanese).

[6] Varga Ferenc: Structural and operational model for volunteer fire brigades. *Hadmérnök*, 13. 2. (2018), pp. 345-359

[7] Bodnár László: Logistic challenges of firefighting in case of moving to the fire site. *American Journal Of Research Education And Development,* 2022 : 1 pp. 27-35. , 9 p. (2022)

Lilla Horváth

Occupational health and safety tasks for the prevention of stress, with particular regard to firefighters

Abstract

In this study, the author provides the reader with a brief introduction to the role and importance of occupational health and safety, in light of stress prevention and reduction. The author makes special mention of the dangers that occur during the work of firefighters and the protective clothing they wear. In the case of the latter, it is about the effect it can have on the wearer while working. At the end of this study, the author emphasizes that, in addition to legal compliance and the provision of equipment, psychological support may also be necessary.
Keywords: health and safety, firefighter, psychology, work, ergonomics

Introduction

Labor protection appeared already in primitive society, since with the division of labor the workload of men and women also differed. In the beginning, work protection was implemented with work organization, hunting tools, and tools with an "ergonomic" design. At the same time of technological development, as people noticed more and more connections between certain activities and the symptoms of various diseases, it became more important to develop all the work organization and tool systems that fall under the auspices of occupational safety. Later on, not only mechanical damage was the source of the risks, but also psychological ones, which nowadays - fortunately - are getting more and more spotlight. Therefore, occupational health and safety has many points of intersection with psychology, if not completely, since a harmful workplace environment also affects the worker's mental state, which in a negative case, reduces work efficiency, and can lead to burnout in the long term.

The legal background of labor protection in Hungary is provided by Act XCIII of 1993 on labor protection. Reading the first lines, we immediately get an answer to what this field deals with:

> "The personal, material and organizational conditions of safe and health-free work to protect the health and working capacity of those working in an organized manner and to humanize working conditions, thus preventing work accidents and work-related illnesses..."

Occupational health and safety is therefore a complex specialized field, the purpose of which is to ensure the physical integrity of the persons participating in organized work and staying within the scope of the work, in addition to ensuring that the psychological strain is not harmful to health. For these conditions to exist in the long term, the employer must take measures that require the involvement of occupational safety specialists. With the help of these qualified persons, the possibility of continuous monitoring is ensured regarding (work) organizational, personal, and material conditions. For this to be fulfilled, the employer needs to prepare a risk assessment, which includes all sources of danger that may pose a risk to safe and non-health-threatening work. According to their origin, these can be physical, chemical, biological, and psychological risks. To prepare a risk assessment that satisfies all aspects properly, it is necessary to know the operation

of the company, the job duties of the employees, the workplace environment, the materials, and tools, etc. After that, we can get a complete picture of all sources of danger that need to be managed and, above all, prevented.

It is worth mentioning office work, since despite the spread of the "home office", many workplaces today still require working in the office.

Regarding office work, the following factors are significant:

- degree of illumination

- reflections (e.g. in the case of a monitor)

- temperature, humidity

- harmonizing colors (stimulating and calming effect)

- hygiene

- safety (e.g.: electrical wires, slippery surfaces, etc.)

In addition to the fact that these factors provide all the conditions necessary to create an ergonomic work environment, they also have a psychological effect.

It is necessary to provide additional protection for firefighters, due to their work, under the conditions provided in the office. Inside the barracks, in addition to the office premises, we can also find unusual designs, tools, and materials, such as dangerous machines. To use all of these safely, it is necessary to master the knowledge material at a skill level, since, while in an office there are everyday tools known from childhood (e.g.: computer, air conditioner, coffee maker, etc.), in a firefighter barrack there are supplies and equipment that require special knowledge.

With the help of appropriate preliminary and repeated professional education, firefighters can carry out their work without fear and with sufficient confidence. The occupational health and safety specialist also contributes to this confirmation, who makes the educational topics, organizes the reviews specified in the legislation, regularly conducts inspections of the work area, or compiles the personal protective equipment allowance system.

In their case, however, the main accident and injury occur during an intervention, as it is considered a dangerous activity. But what should you pay attention to during a firefighting or technical rescue? The following may be non-exhaustive:

- slippery, pointed, irregular ground, environment

- fire, smoke, electricity

- extreme temperature

- dangerous machines (sudden movement, breakdown)

- the proper wearing of personal protective equipment

- team communication

- the sight of injured and dead people (especially children and relatives)

Occupational health and safety, i.e. ensuring the physical and mental health of firefighters, in such cases also extends outside the barracks area, which is provided

by personal protective equipment in addition to the above-mentioned training. Nowadays, in addition to fulfilling the protective function (flame and heat protection, abrasion and cut resistance, waterproofness, etc.), additional roles can be expected from these devices, in summary, they must also be ergonomic. Thanks to technical progress and many years of experience, manufacturers are now able to create clothes from materials that, in addition to a higher level of comfort, even contain additional elements.

Objective

My goal is to present the role of occupational health and safety in the workplace, emphasizing the work of firefighters. In this way, I would like to emphasize how important this area is in creating and maintaining the workplace atmosphere.

For firefighters, the role of personal protective equipment has been highlighted, since its role can be prominent during correct work.

Methods

To present and detail all of this, I used the Hungarian legislation, as well as my own professional experience over several years. In addition, I processed Hungarian and international literature so that the reader can get a more complex picture of this topic.

Findings/results

The study highlighted how important physical conditions, human relations, and communication can be at the workplace, even though, in today's fast-paced world, we, unfortunately, place little emphasis on their defining role.

The development of firefighting protective clothing is relevant both in Hungary and internationally, as in our changing and developing world, it is necessary to adapt in this area as well, to guarantee the safety of both those participating in the rescue and the rescued persons.

Conclusion/Suggestions

The material, fit, and quality of the firefighter's protective clothing have a great impact on the firefighter's psyche since if the protective equipment, e.g. protective gloves, warms up earlier than expected in a dangerous environment, in an already heightened state, it influences the physical reaction of the person in question (e.g.: sweating, heart rate) and decision-making abilities. In many cases, this is invisible to peers, so trouble can quickly occur if the problem is not recognized in time.

Occupational safety appears in prevention to avoid this event, because if the clothing is checked regularly, it is cleaned professionally, and the topic of the correct use of protective clothing is part of the training, then the chance of injury and accidents can be greatly reduced.

If an accident were to occur, it is important to process the case from a firefighting tactical point of view, so that it can be avoided in the future. In addition, if the individual is unable to psychologically process the given event, psychological support activities (e.g. psychological first aid and briefing) can help them through the difficulties.

Stress is present in our everyday life, and we cannot avoid it, but we can do something to recognize it and treat it in time, as it can cause illness in the long term, and ultimately death. Whether we are talking about office work or the work of firefighters, the source of the problem, i.e. stress, affects everyone in the same way, since we are human. The path is not easy for anyone, but it is possible to get external help to make the struggle faster and easier.

References

[1] Act XCIII of 1993 on labor protection.

[2] Bolgár Judit (2021): Veszélyhelyzetek kezelésének és feldolgozásának kognitív és affektív aspektusai, Szemelvények a katonai műszaki tudományok eredményeiből I., Oktatói kötet, Ludovika Kiadó, 42. ISBN 978-963-531-439-3

[3] CALE Learning Enhancement Eastern Washington University: Preventing Burnout, Online: https://inside.ewu.edu/calelearning/psychological-skills/preventing-burnout/

[4] Lilla Horváth (2022): Examination of the application of currently used, new or additional firefighting personal protective equipment, AARMS, 21 (3), 2-3.

[5] Lilla Horváth - Péter Pántya: Home office and ergonomics, *Védelem Tudomány*, 6. 3. (2021), pp. 621-624.

[6] Restás Ágoston: Pszichológia a tűz frontvonalában, *Védelem Tudomány,* 1.3. (2016), pp. 46-56.

János Petrányi - Lajos Kátai-Urbán - Gyula Vass - Attila Zsitnyányi

The relevance of nuclear measurements in the field of industrial safety

Abstract

In the field of industrial safety, nuclear measurements can help to ensure that the necessary decisions can be taken on the basis of objective and accurate information. Nuclear measurements are used in early warning systems, radiation protection systems, but also in the field of emergency response and decontamination. This study focuses primarily on the role of nuclear measurement in industrial safety applications and try to find missing capabilities. For a given radiation related application, the following questions should be answered: "What type and level of radiation should be measured?" and "How to measure it?". This study will try to find the right measuring assembly for some specific tasks like early warning systems, first responder vehicles, decontamination systems.
Keywords: radiation protection, metrology, industrial safety, CBRN, disaster management

Introduction

For applications that release ionising radiation, it is easy to prove the necessity of measurement, as ionising radiation is colourless, odourless and only detectable by humans when it has already caused serious damage. Once the type of radiation is known, i.e. alpha, beta, gamma or neutron radiation, and the measurement range is determined, then it is possible to find the appropriate instrumentation to measure it correctly. Radioactive and nuclear materials are used, stored and transported in large quantities for different purposes. These materials can cause emergency situations. Early warning and alarm systems are designed to detect an increased level of radiation in time and notify first responders. If the contamination has already been released into the environment, for example, a radioactive source has been lost, nuclear measurement should be used for different tasks. A collimated mobile scintillation detector can be used to effectively detect and identify the lost radioactive source. If this sealed radioactive source starts leaking, and a large area gets contaminated, the boundaries of this area can be determined by using nuclear measurement technics. If the released contamination reaches food stocks the contamination level of food stocks also should be checked, with low background measuring instruments. After the decontamination task radiation measuring instruments should be used to ensure that the decontamination was effective.

Objective

The aim of the research is to identify the nuclear measurement tasks in industrial safety applications and to recommend how to improve these applications.

Method

The research method I used was simple observation, in which I searched for relevant references on the subject, examined the advantages and disadvantages

of the solutions found, looked for optimal solutions and, due to space constraints, drew conclusions without explanation.

Findings/results

In the field of industrial safety, the radiation levels to be measured should be adjusted to the dose limits set for individual members of the public (1 mSv/year) and for occupational workers (20 mSv/year) [1]. On this basis, an optimal solution for early warning systems could be the Geiger-Müller counter instrument capable of accurately measuring near background radiation. However, it should be noted that this type of instrument must be verified before use and verified again every 2 years. [2]. In Hungary, the early warning radiological monitoring system of National Directorate General for Disaster Management, Ministry of the Interior (NDGDM) using redundant Geiger-Müller counter instruments and provide information about the current radiation level and create alarm signals if there is any significant increase (> 250 nSv/h) in the radiation level. 4 measuring points in this system also continuously measure the activity concentration of alpha, beta and gamma particles in the air. Thanks to the combined detector, radioactive I-131 can be detected in aerosol-, elemental- and organic form. The capability of the exciting monitoring system can be further improved by installing detectors with isotope identification features and high sensitivity such as the RadNDI scintillation detector (see Figure). It would detect smuggled isotopes in vehicles passing by the monitoring stations.

Figure 1- RadNDI Scintillation detector for isotope identification [3].

Following an alert, a reconnaissance vehicle should be sent to the site to determine the cause of the alert. False alarms may also occur due to naturally occurring radioactive materials or persons being treated with nuclear medicine. Vehicle-mounted radiation detection instruments may have several purposes. The first is to determine the dose received by the occupants of the vehicle, the second is to determine the boundaries of the contaminated area and the third is to detect the presence of radioactive material hidden in the field or in other vehicles.

The Disaster Management Mobile Laboratory (KML) of NDGDM and the Disaster Management Radiation Detection Unit (KSE) have the necessary equipment for radiation reconnaissance missions, but has some limitation regarding on-field sample analytics. Following a nuclear accident, there may be a need for quick checking of stored food stocks and, in some cases, to determine the isotopic composition and activity of a sample of unknown materials. So mobile laboratories should be equipped with portable, low-background, digital gamma-ray spectrometer, such as the IH-111 (see Figure).

Figure 2 - IH-111 Portable Radiological Measuring Instrument [3]

It would also be advisable to equip all vehicles (fire engines, police and ambulances) which are the first to arrive at the site of a potentially contaminated accident with an on-board warning system to monitor the exposure of first responders and avoid areas with high radiation levels.

Radiation exposure of a first responder entering a contaminated area can be significantly reduced with a radiation-shielded vehicle equipped with collective protection The light-armoured, radiation-shielded emergency vehicle (RSV) used for nuclear emergency response at the Paks nuclear power plant can be used in a real emergency situation [4] (see Figure) The on-board monitoring system uses readings from collimated Geiger-Müller tube detectors on both sides of the vehicle to guide the driver in the less contaminated direction. The vehicle has two separate compartments (driver's and passenger compartment) with dedicated dose rate meters that determine the dose received and the remaining stay time for the driver, the commander and the passengers separately. This allows dose limits to be met in the case of a nuclear accident. In Hungary, there is only one such vehicle. A single vehicle may not be sufficient to perform effective emergency response tasks. A possible solution could be to modify vehicles used for other purposes to reach the same capabilities as the RSV.

Figure 3 - Light-armoured, radiation-shielded emergency vehicle (RSV) [4]

After an accident, the mass decontamination of contaminated persons is one of the major tasks. Usually, this contamination involves some other physical injury [5]. In such cases, mobile decontamination systems, like Figure, should be installed in front of hospitals.

Figure 4 - Personel Decontamination Equipment (SZMF-U) [3]

Detectors installed after these systems can independently and continuously monitor the effectiveness of the decontamination line and protect hospital infrastructure and staff from contamination. Measuring equipment can play an important role in enhancing the Quality of service (QoS) in decontamination systems. The BNS-94L is a traditional radiation portal monitor, see Figure, capable of distinguishing contaminated persons and patients being treated with nuclear medicine.

Figure 5 - BNS-94L radiation portal monitors [3].

Conclusion/suggestions

I have investigated several industrial safety applications and the radiation measurement methods currently used in them.

I have made suggestions for their further development.

I started my investigations with early warning systems. I identified one of the possible directions of improvement as upgrading the existing stations with isotope identification capability.

The second application I investigated is on-board radiation measurement, where I also gave some suggestions for improving capabilities in traditional first responder vehicles.

The last topic I introduced was the decontamination systems, where I proposed to improve the QoS with nuclear instrumentation.

References

[1] Magyarország Kormánya, "2/2022. (IV. 29.) OAH rendeletaz ionizáló sugárzás elleni védelemről és a kapcsolódó engedélyezési , jelentési és ellenőrzési rendszerről," *Net jogtár*, vol. 2, no. V. 1., pp. 1–101, 2022, [Online]. Available: https://net.jogtar.hu/jogszabaly?docid=a2200002.oah.

[2] Magyarország Kormánya, "127/1991. (X. 9.) Korm. rendelet a mérésügyről szóló törvény végrehajtásáról," *Net jogtár*, vol. I, no. 1, pp. 1–17, 1991, [Online]. Available: https://net.jogtar.hu/jogszabaly?docid=99100127.kor.

[3] Gamma Technical Corporation, "Website of Gamma Technical Corporation," 2020. http://www.gammatech.hu/ (accessed Jul. 12, 2020).

[4] J. Bana and L. Kovacsóczy, "Sugárárnyékolt jármű lehetséges alkalmazása a baleseti sugárhelyzet felmérésében," *Hadmérnök: KATONAI MŰSZAKI TUDOMÁNYOK ONLINE FOLYÓIRATA*, vol. 17, no. 1, pp. 43–55, 2022, [Online]. Available: http://real.mtak.hu/id/eprint/144006.

[5] I. Turai, Útmutató a Sugársérültek ellátásának minimum követelményeiről. 2007.

Dávid Petrétei

The IAAI – the International Association of Arson Investigators

Abstract

This poster presentation gives a short and brief summary of the IAAI (International Association of Arson Investigators), a professional non-profit organization for arson investigators.
Keywords: arson, investigation, education, research, training, education, organization, journal

Introduction

The International Association of Arson Investigators (IAAI) is a professional non-profit organization for fire investigators, providing resources and support for education, training, research, and methodology. The IAAI was founded in 1949, in Louisville, Kentucky, by 268 members. Recently it is based in Crofton, Maryland, and it has over 10,000 members, 19 standing committees, and 70 chapters (local departments) worldwide.

The structure of the association

The IAAI is governed by the Board of Directors. It consists of four Executive Officers and twelve directors. The four executive officers are the President, 1st Vice President, and 2nd Vice President. The Immediate Past President is still also an executive officer. Twelve more Directors are also members of the Board, and four-four Directors are changing annually. Members and officers of the Board are also elected by the members of the association. The Board of Directors with a two-thirds majority can depose any member or officer of the Board, for a good cause.

The IAAI also employs Staff & Delegates, like the Executive Director, the Director of Administration, and the Director of Government Relations. Since 1983 the IAAI has had a Chaplain, who gives memorial services for the departed members at the beginning of annual seminars. There are some other positions, for example, the manager for international training, the membership coordinator, certification coordinator, database specialist, or accountant. The Past Presidents Council was formed in 1986, to act as an advisory group for the president and the board of directors. [1]

Research and education

The IAAI holds an annual meeting, the ITC (International Training Conference), usually a five-day-long event, held in different cities in the United States. On the other hand, currently (Spring of 2023) the IAAI offers 19 different international classes, for example, „electrical aspects of fire investigation”, „advanced forensic photography”, „investigating youth set fires”, „fire dynamics”, etc. Many of the chapters also offer training seminars. [2]

In February 2005, the IAAI launched the CFITrainer.Net, a distance-learning website with dozens of online courses, with titles and topics like „Wildland Fires Investigation”, „Thermometry, Heat, and Heat Transfer”, „Residential Electrical Systems”, „Investigating Fatal Fires”, „Fire Chemistry”, or „Charleston Sofa Super Store Fire”. Currently (Spring of 2023) there are 81 different training modules on the website, which assist fire investigators in meeting the topical areas contained in NFPA 1033 (Standard for Professional Qualifications for Fire Investigators). [3-4]

Keeping pace with modern times, the IAAI frequently releases podcasts. [5] Also launched a separate website for evidence-collection manuals. [6] The website provides evidence-collection procedures and demonstrations for the most common types of evidence encountered at a fire scene. Collection procedures, checklists of important actions to do to ensure the integrity of the evidence collected and evidence-related questions can be found and accessed.

The IAAI publishes a quarterly journal, „The Fire and Arson Investigator”, which contains articles by some of the leading experts in the world. The magazine has been launched as a newsletter in 1949, nowdays it is a colored, 100-page journal with news, research articles, reports, etc. It is posted to the members four times per year for no additional fee.

Certifications

The IAAI established a wide range of different certifications for professionals.

IAAI-ECT, evidence collecting technician. The Evidence Collection Technician Program verifies an applicant's fundamental ability to perform specific evidence collection tasks related to fire scene investigation at an acceptable level as measured against published acceptable practices. The applicant must provide documentation of meeting minimum requirements including experience, training, and education. After the application is approved, the applicant must then successfully pass a practical examination. Once earned, the designation must be renewed every three years.

IAAI-FIT, fire investigation technician. The IAAI Fire Investigation Technician Program verifies an applicant's fundamental knowledge in NFPA 1021, NFPA 1033, and NFPA 1037, and encourages professional development through recognition of the applicant’s accomplishments in developing competencies related to fire investigation. The applicant must provide documentation of meeting minimum requirements including experience, training, and education. After the application is approved, the applicant must then successfully pass a comprehensive examination. Once earned, the designation must be renewed every three years.

IAAI-CFI, certified fire investigator. The IAAI started this program in 1986, this was the first standardized evaluation of an investigator’s knowledge, skills, and professional experience. The applicant has to prove their experience, certification, and past training, and after it has to pass a closed-book comprehensive exam. Once earned, the designation must be renewed every five years. This certification is accredited by the National Board of Fire Service Professional Qualifications and the Forensic Specialties Accreditation Board (FSAB) of the United States and is widely recognized by foreign agencies as well.

Awards

The IAAI has a separate standing committee for awards and offers seven different awards for members and others.
The George H. Parker Award or the Distinguished Service Award is given to individuals who are active members of the IAAI and have shown outstanding service to the Association. The James L. Smith Award goes to the most outstanding chapters (so not persons). The Guy E. "Sandy" Burnette Award or the Outstanding Accomplishment Award goes to agencies, companies, or municipalities, which have developed successful programs that help to reduce arson incidents. The Award of Recognition goes to any person or organization for service rendered to the IAAI. The awards are limited to two recipients annually.
The Investigator of the Year Award can be given to only one recipient, an individual, who has to show outstanding skills and professional expertise in criminal and civilian arson cases.
The IAAI holds Photo Competition every year. It is supervised by the Photo Committee. First and Second place and Honorable Mention awards are presented for the category of Arson Photography and Accidental Fire Photography.

Last but not least

According to the Code of Ethics, all members of the Internal Association of Arson Investigators are „first and foremost" truth seekers, and regard themself as a member of an important and honorable profession. The IAAI has been connecting fire and arson investigators for 74 years. It has Educational Foundation and offers life insurance for its members.

References

[1] https://www.firearson.com/About-IAAI/Officers-Directors.aspx

[2] https://www.iaaiitc.com/

[3] https://www.fema.gov/case-study/web-based-training-helps-arson-investigation

[4] https://www.cfitrainer.net/en/About-Us/

[5] https://www.firehouse.com/community-risk/investigation-equipment/press-release/21265608/international-association-of-arson-investigators-fire-investigations-group-atf-releases-all-fires-from-2005-dc-serial-arsonist

[6] https://www.iaaievidenceguide.com/

Iván Sibalin – Lajos Kátai-Urbán – Zsolt - Cimer

Research and development of industrial safety activities related to the operation of energy systems

Abstract

Accident- and malfunction-free operation of energy systems is a fundamental condition for achieving environmental sustainability. This presentation identifies and evaluates strategic target areas of supranational and national level strategic documents, which directly or indirectly serve the safe operation of the energy sector.
Keywords: energy systems, industrial safety, strategy, sustainable development, environmental sustainability

Introduction

Sustainable development and the environmental sustainability that is part of it is a complex global strategic vision dependent on many uncertainty factors, which requires the use of tools from several disciplines and fields of expertise. As such, achieving environmental sustainability requires strategic thinking and extensive strategic planning. As a result of this particularity, a fairly large number of environmental protection strategies have been prepared since the 1970s, both at supranational and national levels.
It is essential that strategies take into account all factors that hinder the achievement of the vision they define. Given that energy and industrial safety are areas that play a prominent role in protecting the environment, it is therefore justified to analyse and manage concerns and challenges related to the safe operation of energy systems at a strategic level.

Objective

Numerous scientific studies have already pointed to the problem of the global environmental impact caused by the energy sector. In accordance with this, in both the supranational (international + EU) and national level strategy-making, serious emphasis is placed on the reduction of environmental pollution emitted by energy systems, which thus attaches particular importance to the reduction of normal operating emissions.
However, emergency emissions caused by serious accidents or malfunctions are also to be assessed as a significant environmental burden. Due to their frequency, minor energy accidents and malfunctions are considered constant emitters on a global scale. Serious accidents occur much less frequently, however, if they do occur, they can cause irreversible environmental damage.
It is therefore justified to examine the industrial safety aspects of supranational strategic directions for sustainable development, as well as the theoretical and practical industrial safety strategic aspects – which are aimed at the sustainable operation of the energy sector – contained in national level strategic documents and other relevant professional sources. Keeping these in mind and developing them can contribute to the realization of the strategic vision of environmental

sustainability – and, in a broader sense, sustainable development – by enforcing the safe operation of energy systems as effectively as possible.
The aim of the research was to investigate the extent to which the current supranational and the corresponding national strategic directions contribute to the accident- and malfunction-free operation of energy systems, and thus to the realization of environmental sustainability.

Methods

By studying the supranational strategic directions, it can be established that the relationship between environmental sustainability and industrial safety can be seen in both international and European Union environmental sustainability strategy making. On the basis of the strategies adopted in Hungary, which are relevant from the point of view of environmental sustainability, 14 strategic target areas can be identified, which directly or indirectly serve the accident- and malfunction-free operation of the energy sector. For example, ageing treatment is a typical industrial safety task, which directly helps to prevent industrial accidents. On the other hand, extreme weather conditions can be identified that pose an increasing threat to the built environment , but the defence against them does not necessarily belong directly to the field of industrial safety. For instance, protection against forest fires belongs to fire protection, which is an independent field of disaster management. However, there are points of connection between fire protection and industrial safety tasks and activities , and forest fires can also endanger industrial facilities, so it is important to take this into account.
The two general strategic target areas mentioned below are relevant for all specific strategic target areas, i.e. they serve the implementation of the specific strategic target areas in a general manner.

General strategic target areas:
- encouraging environmental and safety awareness and responsibility for the living environment;
- promotion of environmental technology innovation;

Specific strategic target areas:
- increasing renewable energy production;
- reduction of greenhouse gas emissions – decarbonization;
- utilization of hydrogen for energetic purposes;
- remediation;
- protection against heat waves;
- protection against forest and vegetation fires;
- protection against hazards of hydrological origin;
- dealing with the problem of wind storms and weakening average wind speed;
- protection against snowfall and blizzards;
- ageing treatment;
- strengthening cyber security;
- prevention of the generation of hazardous waste.

Using the strategic documents and the relevant literature the most typical industrial safety and – attributable to technical or meteorological reasons – supply security and other technical security challenges related to these target areas, and the management options of the challenges can be identified.

In relation to all specific strategic target areas, challenges and concerns can be identified that hinder the implementation process of the given strategic target area. In connection with renewable energy production, the problem of weather dependence can be highlighted. Additional questions are raised by the technical safety challenges of carbon dioxide absorption technologies, safety considerations related to P2G and blue hydrogen, as well as the greening of remediation, protection against increasingly extreme climate and weather conditions, ageing of systems and system components, cyberattacks, and problems related to the generation of hazardous waste.

Results

Most of the typical industrial, supply and technical security challenges identified in connection with the specific strategic target areas – based on the studied literature – can be handled with the current level of technical-technological development. Exceptions to this arise in connection with issues related to carbon dioxide absorption technologies, P2G technology, the extensive use of hydrogen for energetic purposes, as well as certain cyber security issues and the use of AI. The management of certain hazardous waste streams, which are expected to be produced in increasing quantities in the future – for example batteries and accumulator wastes – also requires significant technological development.

Conclusions/suggestions

In the above presentation, strategic target areas – that can be read from supranational and national level strategic documents – have been identified, which directly or indirectly serve the safer operation of the energy sector, thus contributing to the realization of environmental sustainability. Most of the industrial, supply and other technical security obstacles that arise in connection with the implementation of the strategic target areas are manageable. However, there are also challenges that require further scientific research.
It is therefore important that the strategy makers take into account the new scientific results aimed at dealing with the identified obstacles and challenges during both supranational and national level strategic planning. Multidisciplinary assessment of their applicability should be carried out depending on cost-effectiveness. The shortest way to enforce them widely is to channel them into supranational and state-level decision-making.

References

[1] Commission Staff Working Document Delivering on the UN's Sustainable Development Goals – A comprehensive approach. European Commission. Brussels, 18.11.2020 SWD(2020) 400 final. Available: https://commission.europa.eu/system/files/2020-11/delivering_on_uns_sustainable_development_goals_staff_working_document_en.pdf (08. April 2023.)

[2] Érces Gergő, Vass Gyula, Ambrusz József: Károsító hatásokkal szemben reziliens épületek jellemzői. In: Bodnár László, Heizler György (szerk.): Nemzetközi Tudományos Konferencia a Katasztrófák Csökkentésének Világnapja alkalmából (Konferenciakiadvány). Budapest, Magyarország: Rádiós Segélyhívó és Infokommunikációs Országos Egyesület (2022) 436 p.

pp. 192-199. Available: https://vedelem.hu/letoltes/document/544-isbn-978-615-01-6985-9-konferenciakotet.pdf (12. April 2023.)
[3] Restás Ágoston, Pántya Péter, Rácz Sándor, Érces Gergő, Hesz József, Bodnár László: A megelőző és mentő tűzvédelem valamint az iparbiztonság kapcsolódásai. In: Vass Gyula, Mógor Judit, Kovács Gábor - Dobor József, Horváth Hermina (szerk.): Katasztrófavédelem 2018: Veszélyes tevékenységek biztonsága. Budapest, Magyarország: BM OKF (2018) 347 p. pp. 340-340. Available: https://kvi.uni-nke.hu/document/kvi-uni-nke-hu/3.%20katvedkonf_2018_IB_posz.pdf#page=31 (12. April 2023.)
[4] Sibalin Iván: Az energetikai rendszerek fenntartható működésével kapcsolatos iparbiztonsági tevékenységek stratégiai célú kutatása és fejlesztése – Doktori (PhD) értekezés. NKE-KMDI. Budapest, 2022. Available: https://tudasportal.uni-nke.hu/xmlui/static/pdfjs/web/viewer.html?file=https://tudasportal.uni-nke.hu/xmlui/bitstream/handle/20.500.12944/19565/sibalin_ivan_doktori_ertekezes.pdf?sequence=1&isAllo (08. April 2023.)
[5] UNECE: Convention on the Transboundary Effects of Industrial Accidents and Sustainable Development Goals. Available: https://unece.org/DAM/env/documents/2018/TEIA/_reduced_size__Portrait-Post-card-Industrial_Accidents-SDG-eng.pdf (08. April 2023.)

Peter Tomka

Thermal imaging cameras in firefighting and disaster management operations

Abstract

Thermal imaging cameras have many uses in fire and disaster management interventions. Different cases and possibilities are presented where the benefits of thermal imaging cameras can be used to support various rescue activities.
In preparing this lecture, the author has drawn on his own professional and research experience, and has incorporated the knowledge revealed in the available and related Hungarian and international literature. The overview and systematic nature of the lecture is used to summarize the benefits of thermal imaging cameras in the field as the title suggests.
Keywords: thermal imaging camera, fire service, disaster management

Introduction

The availability of thermal imaging technology caused a paradigm shift in interior firefighting interventions. The capability to detect heat sources and persons in smoke impaired visibility significantly improved the efficiency and safety of firefighting. With the improvement of thermal imaging technology it became possible to use these cameras beyond firefighting, for example in hazardous materials interventions, inspections by authorities, search and rescue operations and epidemic management.

Objective

The objective of this lecture is to summarize the benefits of thermal imaging cameras in different fields of disaster management. To be able to use thermal imaging in various use cases, we have to be aware of how thermal cameras work and what their limitations are.

Methods

In his research the lecturer has drawn on his own professional and research experience. Furthermore he incorporated the knowledge revealed in the available and related Hungarian and international literature.

Findings/results

Operating principals
Traditional cameras capture the electromagnetic radiation visible to the human eye. By using sensors that that can sense other parts of the electromagnetic spectrum, it is possible to gather information without the presence of visible light. Every object emits electromagnetic radiation in the mid- and long-wavelength infrared spectrum according to their temperature. Thermal detectors can capture this radiation and convert it into a digital signal. Thousands of these detectors arranged into a matrix produces a thermal image of the measured object. [1]

Interior firefighting

The introduction of thermal imaging cameras revolutionized firefighting. It made intervention tactics more efficient and enhanced safety. During interior firefighting, visibility can be extremely impaired by smoke and steam. In these circumstances the image from thermal imaging cameras can offer critical information. They give a basic overview of the area and help finding the source of the fire and missing persons.

Firefighting cameras need to be easily operated while wearing gloves with only a few buttons, features should be focused only onto a few basic functions. They need to withstand heat, impact, water and steam, and safe to operate in hazardous environment. The battery should provide at least 90 minutes of operation, so it can last for the use of two SCBA tanks. Lastly it is important that the gained image is easily understandable and the thermal environment can be determined.[2]

Traditional firefighting thermal imaging cameras are relatively large. With the advancement of technology their weight decreased, while their precision, functions and operating time improved. In recent years small, simple and cheap firefighting cameras have been introduced to the market with the intention of equipping every responding firefighter with his on personal thermal camera. These can be standalone, integrated into the SCBA manometer or into the SCBA mask.[3]

Hazardous materials interventions

Thermal cameras can be used during reconnaissance in hazardous materials interventions. Fluid levels can be determined in uninsulated containers because of the temperature differences. The source of a liquid spillage can be determined if there is a temperature difference between the environment and the spilled material. A gas leak is an endothermic process, so the location of the leak cools down compared to the rest of the tank or pipe.[4]

Hazardous materials operations have similar requirements towards the cameras as firefighting operations. They need to be simple to operate in protective equipment, withstand impact, water and steam, and have to be safe to use in explosive environments. The thermal range of the image needs to be adjustable, so thermal differences can be detected.[5]

Official authority proceedings

Thermal cameras can support the official proceedings of the disaster management authorities. During industrial safety inspections overloaded electrical systems, faulty machines an equipment can be located. Similarly to hazardous materials operations, container fill levels, spills and leaks can be detected. In the early stages of fire investigation, thermal imaging cameras can help finding the source of the fire.

These tasks don’t require a special design, so these cameras can be relatively cheap. Thermal imaging accessories for smart phones can also be used.[6]

Search and Rescue operations

As the human body is 36,5° on average, it can be easily discerned from the environment in most cases. This makes thermal imaging cameras usable during searches for persons out in the open or under rubble. In open areas cameras developed for law enforcement and hunting purposes are suited best, as their image and field of vision is optimized for recognizing humans and animals in a distance. During Urban Search and Rescue operations thermal sensors can help find persons trapped under the rubble.[7]

Thermal imaging cameras on aerial vehicles

Thermal imaging cameras aerial vehicles can effectively search vast areas for the desired heat signature. The spread of drones makes aerial reconnaissance cost effective for firefighting and disaster management. During wildfires the precise location of the fire can be determined, which helps finding the nest of the fire and preventing re-ignition. Likewise, persons on the ground can easily be detected which assists locating missing persons during search and rescue operations.[8][9]

Epidemic management

The Covid-19 pandemic highlighted the use of thermal imaging cameras in epidemic management. Although fever is not always a symptom of diseases, a portion of the diseased can be filtered out. Thermal imaging cameras can detect a rise in body temperature without physical contact.[10]

Conclusions/suggestions

Thermal imaging during different firefighting and disaster management operations makes the invisible visible. With the information gained through thermal imaging cameras hazards can be detected and missing persons can be found, making these operations more safe and efficient. Although the current technology already hugely improves interventions, the real revolution can be achieved by combining it with artificial intelligence and machine learning. This makes the automatic interpretation of the thermal images possible, which makes detection of hazards and persons faster than humanly capable.[8]

In the future thermal cameras with augmented reality functions will be capable of projecting further data, images, blueprints onto the gained image, mixing visible and thermal images with digital sources.

References

[1] Rikke Gade, Thomas B. Moeslund: Thermal Cameras and Applications: A Survery; Machine Vision and Applications 25; pp. 245-262., (2014)

[2] Silvio Faulstich, Josef Helpenstein: Verhalten im Innenangriff; Feuerwehr-Magazin Sonderheft 1/2008; pp. 64-69.

[3] Pántya Péter: A tűzoltósági, katasztrófavédelmi szervezetek technikai, műszaki fejlesztésének helyzete és lehetőségei; Szemelvények a katonai műszaki tudományok eredményeiből I.; pp. 203-216., (2021) Ludovika Egyetemi Kiadó

[4] Vincent Lee: Using thermal imaging in fighting hazardous fires [Online] Elérhető: https://gulffire.mdmpublishing.com/using-thermal-imaging-in-fighting-hazardous-fires/ (Letöltve 2023.04.07.)

[5] John Hays: Thermal Imaging: Using Thermal Imaging On the Hazmat Call [Online] Elérhető: https://www.firehouse.com/operations-training/thermal-imagers/article/11564303/thermal-imaging-training (Letöltve 2023.04.07.)

[6] Rahne Eric: Villamos berendezések termográfiai vizsgálata (II): gyakorlat, felfedezhető villamos hibák, megfelelő hőkamera, Villanyszerelők lapja 2008/06. pp. 2-5 (2008)

[7] Nikolaos Doulamis, Panagiotis Agrafiotis, George Athanasiou, Angelos Amditis: Human Object Detection using Very Low Resolution Thermal Cameras for Urban Search and Rescue; PETRA '17: Proceedings of the 10th International Conference on Pervasive Technologies Related to Assistive Environments; pp. 311–318. (2017) Görögország

[8] Restás Ágoston: Thematic division and tactical analysis of the UAS application supporting forest fire management in Advances in Forest Fire Research, D. X. Viegas és L. M. ibeiro, szerk. Coimbra, Portugália : Universidade de Coimbra; pp. 1561-1570. (2014)

[9] Córdova C. Andrea, Jiménez Q. Byron, Pardo I. Jorge, Toalombo CH. Inti, Wilbert G. Aguilar: Geolocation and Counting of People with Aerial Thermal Imaging for Rescue Purposes; AVR 2018: Augmented Reality, Virtual Reality, and Computer Graphics; pp. 171–182. (2018)

[10] Jia-Wei Lin, Ming-Hung Lu, Yuan-Hsiang Lin: A Thermal Camera Based Continuous Body Temperature Measurement System; Proceedings of the IEEE/CVF International Conference on Computer Vision (2019) Korea

András Kristóf Kozma – László Bodnár

The Flood of Szombathely and the PTS-M amphibious Soviet tank

Abstract

In 1965, the city of Szombathely in Hungary was hit by a massive flood that caused widespread damage and loss of life. The flood was caused by heavy rainfall and the overflow of the nearby Raba River. The water levels rise quickly and many people were caught off guard. The floodwaters reached heights of up to 3 meters in some areas, causing significant damage to homes, businesses, and infrastructure. The Hungarian government responded quickly to the disaster by deploying a number of resources to the affected areas. One of the most important tools they used was the PTS-M amphibious vehicle. The PTS-M was a Soviet-designed amphibious vehicle that was capable of operating in high water conditions. It was originally designed for military use, but was adapted for civilian rescue and recovery efforts during natural disasters. The PTS-M proved to be an effective tool for rescue and recovery efforts in the aftermath of the flood. It was able to navigate through the high waters and reach areas that were inaccessible by other means. The vehicle was used to transport people to safety, deliver food and supplies to those in need, and help clear debris from the streets [1].
Keywords: flood, amphibious tank, rescue,

Amphibious vehicles in Hungary

The Hungarian Defence Forces had a number of Soviet-origin combat vehicles, including amphibious vehicles. The country used these vehicles, among other things, during the 1965 Szombathely flood. An example of it is the PST-M, which had to be deployed in the above-mentioned settlements by the flood defence forces. It has a maximum speed of 40 km/h and a range of 300 km. It has 6 pairs of wheels and is an open vehicle.Like the BAV 485, and unlike the DUKW, it has a rear loading ramp. The crew is seated at the front, leaving the rear of the vehicle open for a vehicle, which can be driven (or backed) in, rather than lifted over the side [2].

1965 Szombathely flood

On the morning of 22 of April 1965, the city woke up to flooding. The sudden heavy rainfall caused the Arany-, Gyöngyös- and Perint- streams to burst their banks at the same time, causing major flooding in and around the town. Water poured down the streets of Szombathely, houses collapsed and families had to be evacuated [3]. The tidal wave receded in two days, leaving severe damage in its wake. It was the biggest flood in the city's history. Professionals [4] and volunteers were also involved in the response during the reconstruction [5].

Figure 1 - Szombathely Sorok Street during the flood. Made by: Kaczmarski Béla.

Rescue processes

Flood protection was carried out by the West- transdanubian Water Directorate. Ferenc Gál, the director, played an extremely important role in this [6]. The Soviet armoured amphibious vehicles of the Hungarian Defence Forces were mobilized to help the people trapped in their homes, workplaces, places of residence or displaced by the flood. They were mainly used in the settlements of Kőszeg, Gencsapáti and Lukácsháza. In these places, even before modern operational control [7], flood could endanger not only human life and property, but also other dangerous installations [8].

References

[1] Engi Zsuzsanna - Somogyi Katalin: Megemlékezés az 1965.évi árvízről a kisvízfolyások mentén. http://www.nyuduvizig.hu/upload/SK_EZs_megemlekezes_az_1965_evi_arvizrol.pdf Download: 10.05.2023.

[2] Hogg, Ian V., and Weeks, John. The Illustrated Encyclopedia of Military Vehicles. (London: Hamblyn Publishing Group, 1980), p.309, "PTS Tracked Amphibian".

[3] Ambrusz József: A természeti csapásokat követő helyreállítás rendszere. Bolyai Szemle, 23. 3. (2014), pp. 131-149.

[4] Pántya Péter - Rácz Sándor: Vízben végrehajtott mentés oktatása és annak tapasztalatai a Katasztrófavédelmi Oktatási Központban, valamint a Nemzeti Közszolgálati Egyetemen. Bolyai Szemle, 23. 3. (2014), pp. 51-61.

[5] Bérczi László - Varga Ferenc: Az önkéntes tűzoltóegyesületek tűzoltási és műszaki mentési feladatai. In: Önkéntesség a katasztrófavédelemben. BM Országos Katasztrófavédelmi Főigazgatóság (2014) pp. 1-20.

[6] Zsuzsanna Priváczki-Juhászné Hajdu - Árpád Muhoray: Improving resilience of settlements situated in plain areas in relation to inland excess water flood and drought risk. Polgári Védelmi Szemle, 13 : Különszám (2020), pp. 238-266.

[7] Igaz-Danszky Tamás - Hesz József: Development of Operation Control at Hungarian Disaster Management. In: Bodnár László-Heizler György: Proceedings of the Fire Engineering & Disaster Management Prerecorded International Scientific Conference. Poster pp. 483-483.

[8] Cimer Zsolt - Vass Gyula - Zsitnyányi Attila - Kátai-Urbán Lajos: Application of Chemical Monitoring and Public Alarm Systems to Reduce Public Vulnerability to Major Accidents Involving Dangerous Substances. Symmetry 2021, 13, 1528. https://doi.org/10.3390/sym13081528

[9] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. *Polgári Védelmi Szemle*, 14. DAREnet projekt Különszám (2022), pp. 116-131.

[10] Makó A - Elek B: Measuring the fluid conductivities of soil in multiphase system. Cereal Research Communications, 34 .1. (2006), pp. 239-242

Balázs Tóth

In some damage cases, the subjective performance of firefighters based on load

Abstract

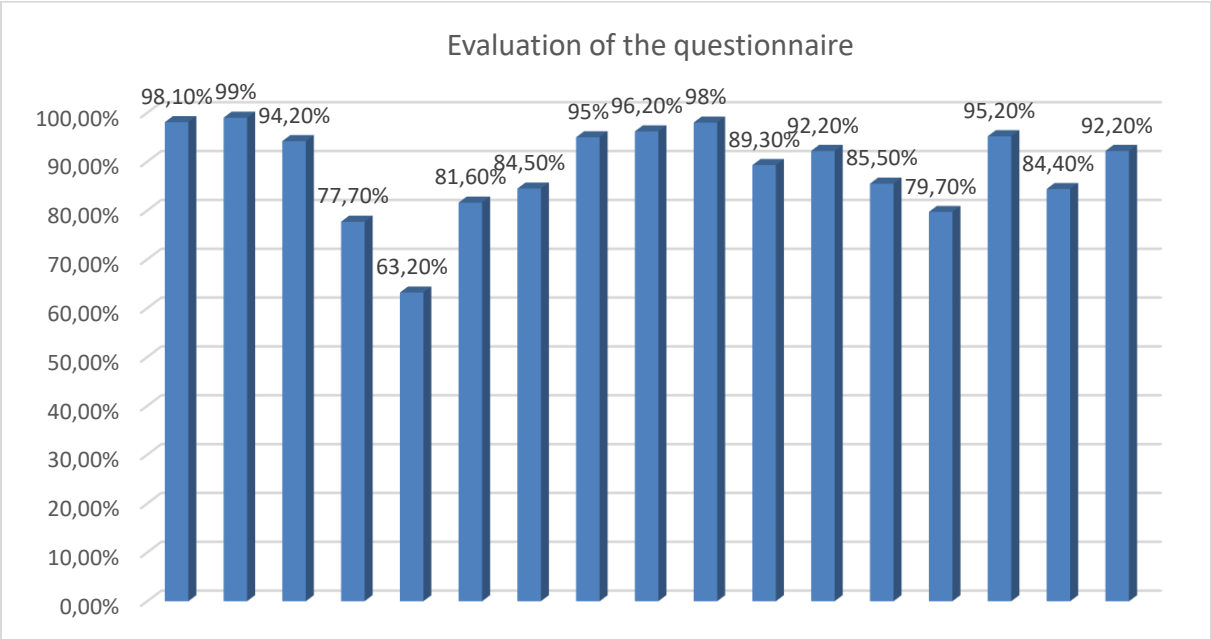
Firefighters are one of the most respected members of our society. In Hungary, the trust of those surveyed in our firefighters is exceptionally high, as they can enjoy a popularity of 97%.[1] For them, the desire to do and help in all circumstances is important, which was proven 78,375 times in the year 2021. During the interventions, 22,428 cases of fire were attended, and 36,297 technical rescues were carried out.[2] In many cases, firefighters are exposed to strong physical stress that can put their bodies to the test. In addition to the physical load, firefighters also need to be able to give their maximum mentally. In order to present the above, in my publication I formulated the objective of determining how burdensome the liquidation of each type of damage is considered by the intervention staff. In order to achieve this, I chose the online questionnaire survey method. We can safely say that the work they do during interventions is very different from all other working conditions, which is why I think it is important that as much research and investigation as possible deal with these physiological and decision-making difficulties and situations that we experience. One of the factors affecting physiological functions is the wearing of protective equipment, which can significantly affect the comfort of firefighters. My goal was to have 50-100 people from the intervention staff answer the questions in my questionnaire. The questionnaire was created with the help of Google forms, with the possibility of answering on a linear scale. It was possible to answer on a scale from 1 to 10, according to how burdensome they consider the indicated types of damage. Following the principle of gradation, marking on a scale of 10 is proportional, which is divided between "not burdensome at all" and "very burdensome".
Keywords: firefighter, physical load, heat stress, decision-making, physical stress, online questionnaire

Discussion

During the liquidation of each type of damage, the interveners are always subjected to a different degree of burden. The nature of the case and the environmental factors can significantly influence the physical strain of firefighters, as well as the duration and complexity of the intervention. During the design of the questionnaire, I tried to ask the question in such a way that the attention and motivation of the respondents was uniform during the filling. I tried to make the questions as clear as possible, and to formulate the question as clearly as possible in the introductory part of the questionnaire.

In a very short time, they filled out the questionnaire in an appreciable amount, 103 people in number. Based on the amount of responses received, I consider the results of the questionnaire suitable for drawing clear conclusions from the results. After summarizing the questionnaire, the results show that the 103 respondents, based on their practical experience in the 6/2016 The BM OKF considers the damage types selected and asked as questions in accordance with chapters 1 and

2 of Annexes 1 and 2 on the issuance of the Fire Fighting Tactical Regulations and the Technical Rescue Regulations to be burdensome.[3]
Looking at the response options from 1 to 10 on the linear scale, most of them indicated a value of 5 or higher. This means an average of 88.5%. The figure below summarizes the answers to the question with a score of 5 or higher in percentage form.



References

[1] A Katasztrófavédelem Évkönyve 2021.

[2] Érces Gergő - Ambrusz József: Természeti csapásoknak ellenálló épületek. Polgári Védelmi Szemle, 14. DAREnet projekt Különszám (2022), pp. 116-131.

[3] BM OKF 6/2016 (VI.24.) utasításának 1. számú mellékletének I. fejezete https://www.katasztrofavedelem.hu/20902/a-hivatalos-rtestben-megjelent-egyb-kzjogi-szervezetszablyoz-eszkzk

[4] Hornyacsek Júlia A tudományos kutatás elmélete és módszertana 91. oldal letöltve:2023. 04. 19. https://hhk.uni-nke.hu/document/hhk-uni-nke-hu/Teljes%20sz%C3%B6veg!.pdf

[5] Bodnár László: Examination of the carried overload for firefighters with a physical load test. Védelem Tudomány, 6. 3. (2021), pp. 513-530.

[6] Ragács Nikoletta - Elek Barbara: Energiahatékonyság és/vagy tűzvédelem? Védelem Tudomány, 3. 2. (2018), pp. 51-66

[7] Finta Viktória - Rácz Sándor: Firefighter Intervention in Radiological Emergencies. In: Milanko, Verica; Laban, Mirjana; Mračkova, Eva (szerk.) 5th International Scientific Conference on Safety Engineering and 15th International Conference on Fire and Explosion Protection. Novi Sad, Szerbia : University of Novi Sad, Faculty of Technical Sciences (2016) 530 p. pp. 180-186.

Zoltán Szilcsanov

Significant changes in NATO Civil Emergency Planning and the issue of resilience.

Abstract

Each NATO member country needs to be resilient to resist and recover from a major shock such as a natural disaster, failure of critical infrastructure, or a hybrid or armed attack. Resilience is a society's ability to resist and recover from such shocks and combines both civil preparedness and military capacity. Civil preparedness is a central pillar of Allies' resilience and a critical enabler for the Alliance's collective defense. The principle of resilience is anchored in Article 3 of the Alliance's founding treaty. Article 3 helps to give NATO the means to fulfil its core tasks, in particular, that of collective defense. The individual commitment of each and every Ally to maintaining and strengthening its resilience reduces the vulnerability of NATO as a whole. Resilience is first and foremost a national responsibility. Each Ally needs to be sufficiently robust and adaptable to deal with and address the entire spectrum of crises envisaged by the Alliance. But from where did resilience itself evolve? I am looking for scientific answers to this.
Keywords: NATO, resilience, civil emergency planning response, collective defense

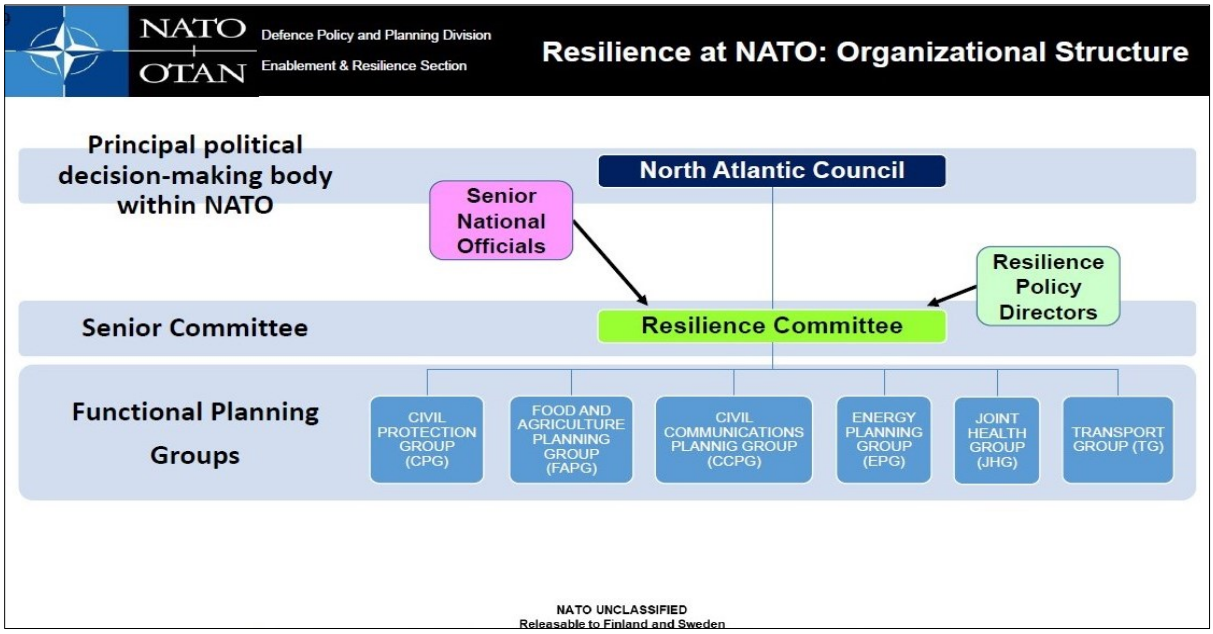
Introduction

The Resilience Committee (RC, earlier: Civil Emergency Planning Committee) is NATO's largest non-military advisory board. All NATO member states must build resilience system against military and non-military threats and challenges to the security of the Alliance, such as natural disasters, disruption of critical infrastructure, and hybrid or armed attacks. Resilience is both a national responsibility and a collective obligation under the North Atlantic Treaty, grounded in Article 3. This article is based on unclassified documents only. The RC is responsible for the strategic and policy direction, planning guidance, and general coordination of resilience activities at NATO, as set out in the 2021 Strengthened Resilience Commitment, the NATO 2030 agenda and the 2022 Strategic Concept. Established in 2022, and the first meeting was in 19 May, 2022. It subsumes and continues the functions and roles of the Civil Emergency Planning Committee (CEPC), which was first created in the 1950s.

Objective/Methods

- research of official documents (unclassified) in connection with resilience,
- analyze relevant guidelines, strategic documents, and reports, such as:
- Strengthened Resilience Commitment
- NATO 2030 agenda
- 2022 Strategic Concept
- use knowledge of the Doctoral School of Military Engineering of the National University of Public Service,

Where is the RC in NATO's structure?



The planning groups within the RC

What is Resilience really?

The source of resilience is Article 3 of the NATO North Atlantic Treaty, which clearly describes the scope and tasks of resilience. Based on NATO's three core tasks: deterrence and defense; crisis prevention and management; and cooperative security.

"In order more effectively to achieve the objectives of this Treaty, the Parties, separately and jointly, by means of continuous and effective self-help and mutual

aid, will maintain and develop their individual and collective capacity to resist armed attack." It gives NATO the means to fulfil its core tasks. The Resilience Committee defines the key priorities for resilience-related activities within the Alliance, translating NATO's ambitions for national and collective resilience into tangible actions and guidelines.

The committee will ensure that all resilience-related activities undertaken by the Alliance are conducted from the perspective of government and society as a whole. It also coordinates with NATO military bodies and other NATO Committees dealing with the wider resilience agenda, including by providing appropriate politico-military advice and promoting the mainstreaming of resilience into NATO's defence planning, operations and activities.

The Resilience Committee also oversees the activities of the Euro-Atlantic Disaster Response Coordination Centre (EADRCC).

The milestones of the Resilience:

Allies' commitment to resilience - the process

The first step was the Commitment to Enhance Resilience in 2016 at the Warsaw Summit. The policy makers established the tools to strengthen the Alliance's resilience and developed evaluation criteria to support Allies in implementing national resilience self-assessments. This is also highlighted in the statement as well: "We are today making a commitment to continue to enhance our resilience against the full spectrum of threats, including hybrid threats, from any direction. Resilience is an essential basis for credible deterrence and defence and effective fulfilment of the Alliance's core tasks."

In 2021, Allied Heads of State and Government agreed a Strengthened Resilience Commitment in Brussel Summit in 2021 to further enhance national and collective

resilience and civil preparedness: "Today we renew and strengthen the commitment we made in 2016 in Warsaw by further enhancing our national and collective resilience and civil preparedness in an increasingly complex security environment "Resilience is a national responsibility and a collective commitment."

The increased focus on resilience will lead to increased cooperation between civilian and military stakeholders. Cooperation agreements between them are mutually beneficial in peacetime and in crisis situations. The COVID-19 pandemic, for example, showed that military assistance to civil authorities was critical when civilian resources were under severe strain. NATO recognized the seriousness of this, for which allied tasks were defined in 2022 in the Strategic Concept. The Allies had to designate a senior official to coordinate national resilience efforts and enhance consultations within NATO.

Seven baseline

At the 2016 NATO Summit in Warsaw, Allied Leaders decided to boost NATO's resilience to the full spectrum of threats and continue developing their countries' individual and NATO's collective capacity to resist any form of armed attack. They agreed seven baseline requirements for national resilience against which member states can measure their level of preparedness:

- Assured continuity of government and critical government services: for instance the ability to make decisions, communicate them and enforce them in a crisis;
- Resilient energy supplies: back-up plans and power grids, internally and across borders;
- Ability to deal effectively with uncontrolled movement of people, and to de-conflict these movements from NATO's military deployments;
- Resilient food and water resources: ensuring these supplies are safe from disruption or sabotage;
- Ability to deal with mass casualties and disruptive health crises: ensuring that civilian health systems can cope and that sufficient medical supplies are stocked and secure;
- Resilient civil communications systems: ensuring that telecommunications and cyber networks function even under crisis conditions, with sufficient back-up capacity. This requirement was updated in November 2019 by NATO Defence Ministers, who stressed the need for reliable communications systems including 5G, robust options to restore these systems, priority access to national authorities in times of crisis, and the thorough assessments of all risks to communications systems;
- Resilient transport systems: ensuring that NATO forces can move across Alliance territory rapidly and that civilian services can rely on transportation networks, even in a crisis.

As we have seen with the migrant crisis and the flood of refugees from Ukraine, the topic of the third requirement has also put a heavy strain on disaster management and humanitarian organizations. The fifth requirement is the most relevant for the Hungarian disaster management system for professionals and volunteers as well.

Findings:

Examining the guidelines, documents, directives issued by the North Atlantic Treaty Organization it became clear that the issue of resilience must be dealt with. It is necessary to think through whole of government, and whole of society approach. NATO is taking a holistic approach to crisis management, which involves participation in all phases of a crisis and takes into account a wide range of effective tools across the whole spectrum of crisis management.

Conclusions / suggestions:

The resilience is a national responsibility and a collective commitment as well. Understanding the resilience agenda requires a closer relationship with the NATO. Civil-Military Cooperation is an opportunity to work more closely and effectively together, to learn about organizational cultures and to better use military capabilities to respond to future crises. Opportunities such as joint exercises should be better taken into consideration.

References:

[1] NATO homepage for Civil Emergency Planning
https://www.nato.int/cps/en/natolive/topics_50093.htm

[2] NATO Resilience, civil preparedness and Article 3
https://www.nato.int/cps/en/natohq/topics_132722.htm

[3] Strengthened Resilience Commitment
https://www.nato.int/cps/en/natohq/official_texts_185340.htm

[4] NATO 2030 agenda
https://www.nato.int/nato2030/

[5] 2022 Strategic Concept
https://www.nato.int/strategic-concept/

[6] "Resilience is in NATO's DNA" Refresher/Info Session to the Experts and Enablement and Resilience Defence and Division Policy and Planning HQ International Staff, NATO 7 February 2023

[7] Görög, Katalin - Muhoray Árpád - Zellei Gábor - Becze Réka: NATO polgári veszélyhelyzet-kezelés és Magyarország. In: Szenes, Zoltán (szerk.) A mai NATO : A szövetség helyzete és feladatai Budapest, Magyarország : HM Zrínyi Térképészeti és Kommunikációs Szolgáltató Nonprofit Kft. (2021) 267 p. pp. 213-230

Bence Lakatos – Gyula Vass – László Teknős

Examining the possibilities for further development of the authorities tasks of disaster management

Abstract

With our research, We set the goal of increasing efficiency, increasing security and ensuring system-level resilience. We examine the increase in efficiency through the applicability of smart devices and moreover we analyze the issue from two sides, one, from the authority side, and on the other, from the public side. The need to increase safety and its sustainability is also important, since the increase in the number of facilities that are a potential source of danger, increases the number of authority cases, and this rate of economic growth presupposes. We also prioritize high-quality work and further improvement. Our goals, systemic resilience improve is extremely important in the professional disaster management organization. Since in our ever-faster changing modern world, we are faced with new challenges, against which our system must be equipped with a protective net of flexible resistance. In order to achieve the goals, we use both quantitative and qualitative methods, such as questionnaire research, interviews, document and content analysis, measurements, and statistical analysis of their data.
Keywords: e-governance, disaster management, specialist systems, Industrial 4.0

Figure 1 - Abstract of this paper. Created by the Authors.

Figure 2 - Introduction. Created by the Authors.

Introduction

The people of our time can see the digital development on a rapid scale, which is due to the fourth industrial revolution and, according to some researches, even the fifth industrial revolution due to robotics. In this wave of development, it is also essential that the provision of state tasks itself undergoes a kind of development, and this resulted in the completion of electronic and e-public administration. The development of e-public administration also brought with it the fact that the technologies used in the field of disaster management, influencing the organization's work, procedures and the regulations and conditions regarding their content have undergone a continuous wave of changes. Questionnaires were used to investigate the impressions and expectations of e-public administration on both the authority and the public side. Summarizing the results, the most significant advantages and disadvantages are listed in the diagram below. These include increasing efficiency, economy, speed, constant access and simplicity. In the case of disadvantages, several people on both sides indicated that they were uncomfortable and confusing, cumbersome, the pages were too crowded, opaque, this is what we call the lack of white space surface, i.e. the lack of sufficient transparency and airiness. The lack of physical connection also appeared as a problem, the direct connection is lost, while another disadvantage is the lack of consistency and responsiveness, which is the provision of neutral surfaces of the device used, so a uniform interface and a uniform image should be available everywhere.

Objectives/Methods

SYSTEMS OF THE AUTHORTIES ACTIVITIES BY DISASTER MANAGEMENT:	The system supporting authorities proceedings	The system for authorities administration	The system for citizen contact and administration
Authority Data Service System, HADAR, which is part of the online KAP system	X	X	-
Robotzaru NEO as an integrated administrative and case processing electronic document management system	X	X	X
ÉTDR as an electronic documentation system supporting construction authority licensing procedures	-	X	X
Office Gate System (HKP)	-	X	X
Authority workflow organization and data provision system, HAMAR	X	X	-
IHR (Integrated Authority System) Authority Customer Portal	-	-	X
TakarNet Land Registry Information System	X	-	X
KSZNY, the Registry of Administrative Sanctions	X	-	-
e-Paper service through the customer portal system	-	-	X
ÁNYK, general form filling program	-	-	X

Figure 3 - Objectives and Methods 1**.** Created by the Authors.

In the table, we have summarized the test results of the applied systems based on three aspects, according to whether they have the characteristics of a system that supports authority proceedings, a system that supports authority administration, and a system for citizen contact and administration. Based on the results, it can be seen that RobotZsaru NEO and HAMAR together with the IHR system are able to meet all three aspects, while the other systems are only focused on one special area.

I wanted to illustrate the tasks related to the authority activities appearing in the organizational system of disaster management according to the division of the individual areas. The figure shows that there are specialist areas that are part of the authority activity and task system, and there are those in which this is already

divided into other tasks as well. In the case of the areas, I would highlight fire prevention, water affairs and industrial safety, as these are at the forefront of the number and importance of authority acts carried out in the professional disaster management organizational system.

Cost-effectiveness in connection with the operation of the applied specialist systems means that they can fulfill their purpose safely even with a minimum energy requirement. This means nothing more than reducing the ecological footprint of the public administration to a minimum. This should be the primary goal of all research and investigations related to authorities activities. The other is sustainability, which means that through the selection of the applied systems and methods, with the allocation of resources, while minimizing the resources to be devoted to a case, security can be guaranteed while taking into account the customer's needs and interests, so that the service character can prevail. And this is the greening process of public administration itself.

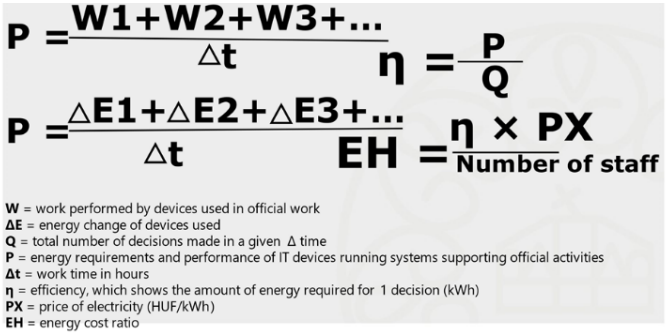


Figure 4 - Results of the paper. Created by the Authors.

Results

In order to calculate the energy cost ratio of administration, it is necessary that the data of all workstations used for authorities activities operating with electricity be summed up and distributed by the delta value of the working time expressed in hours. The energy demand and performance, the P value, can also be obtained by dividing the total value of the energy changes and the time change. The eta, the efficiency is obtained by the quotient of the P value and Q, that mean, how many decisions were made during a given working time. The EH, as an energy cost ratio indicator is obtained by dividing the product of the eta and the price of electricity by the number of employees.

But what do we need for an electronic public administration system to be efficient and successful?

First of all, there is a need for a software or application with a user-friendly interface, which takes into account the fact that it is transparent, reduces administrative burdens, and at the same time helps clients access the necessary data, as well as the transparency of business processes without IT knowledge. Can also guarantee stability and reliability are also important features, since must be guaranteed both by the authority and the client side and for this, a suitable infrastructural background is also necessary. The situation is that the workforce is essential for every change at the organizational level and in this case, the appropriate level of preparation of the staff of the public administration and ensuring the motivation to use the new system. If these are present, then we can

say that the last element is absolutely necessary. This can be considered one of the most important, namely openness and motivation on the part of citizens and entrepreneurs towards the application of the new system. The existence of these structured from the bottom up is necessary in order for an innovative process improvement system to contribute to successful and efficient e-public administration.

References

[1] Cimer Zs., Vass Gy., Zsitnyányi A., Kátai-Urbán L. (2021). *Application of Chemical Monitoring and Public Alarm Systems to Reduce Public Vulnerability to Major Accidents Involving Dangerous Substances*, SYMMETRY 13: (8) pp. 1-16.

[2] Érces G., Ambrusz J. (2019). *A katasztrófák építésügyi vonatkozásai Magyarországon*, Védelem Tudomány: Katasztrófavédelmi Online Tudományos 45-83.

[3] Érces G., Vass Gy. (2022). *Okos épületek, okos városok tűzvédelmének alapjai: III. rész* Védelem Tudomány: Katasztrófavédelmi Online Tudományos Folyóirat VII: 3 pp. 29-46., 18 p. (2022)

[4] Hábermayer T. (2020). *Az ár- és belvíz elleni katasztrófavédelmi feladatok korszerű megoldásának lehetőségei*, Doktori értekezés, Nemzeti Közszolgálati Egyetem Hadtudományi és Honvédtisztképző Kar KMDI

[4] Kátai-Urbán L. (2014). Establisment and Operation of the System for Industrial Safety within the Hungarian Disaster Management. *Ecoterra*, *11*(2), 27–45.

[5] Kátai-Urbán L. (2015). *Veszélyes üzemekkel kapcsolatos iparbiztonsági jogintézmény és eszközrendszer fejlesztése Magyarországon*. Nemzeti Közszolgálati Egyetem.

[6] Lakatos B. (2021). Investigation of Smart Tools in Order to Improve the Effectiveness of the Administration of Disaster Management I. *Belügyi Szemle, 69*(SI1), 142–157. https://doi.org/10.38146/BSZ.SPEC.2021.1.8

[7] Lakatos B. & Teknős L. (2019). Az „új" eljárási törvény eddigi, valamint a jövőben hatályosuló szankció törvény várható hatása a hivatásos katasztrófavédelmi szervek hatósági tevékenységére. *Védelem Tudomány*, *4*(4), 167–180.

[8] Mógor J., Mészáros K. É., Angyal I. (2014). *Új elemek a katasztrófavédelmi hatósági tevékenységben* VÉDELEM KATASZTRÓFAVÉDELMI SZEMLE 21 : 3 pp. 5-9. , 5 p.

[9] Nemeslaki A. (2018). A magyar közigazgatás digitális transzformációjának jelentősége a vezetéstudományban: beköszöntő a tematikus számhoz. *Vezetéstudomány*, *49*(7-8), 2–5. https://doi.org/10.14267/VEZTUD.2018.07-08.01

[10] Teknős L. (2020). *Az éghajlatváltozás és a rendkívüli időjárás hatásaiból adódó katasztrófavédelmi feladatok kockázatalapú megközelítése*. Nemzeti Közszolgálati Egyetem Közigazgatási Továbbképzési Intézet.

[11] Vass Gy. (2017). Industrial Safety Training in Disaster Management Higher Education In Hungary. *Pozhary i Chrezvychajnye Situacii: Predotvrashenie Likvidacia, 8*(2), 80–84.

3rd Fire Engineering & Disaster Management Prerecorded International Scientific Conference Védelem online cooperated with the University of Public Service 26th of April, 2023. Budapest, Hungary

VÉDELEM ONLINE

VÉDELEM TUDOMÁNY

KATASZTRÓFAVÉDELMI ONLINE TUDOMÁNYOS FOLYÓIRAT

Védelem Tudomány

Budapest

2023